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NEARCTIC MITES OF THE FAMILY PSEUDOLEPTIDAE

by
E. A. McGregor

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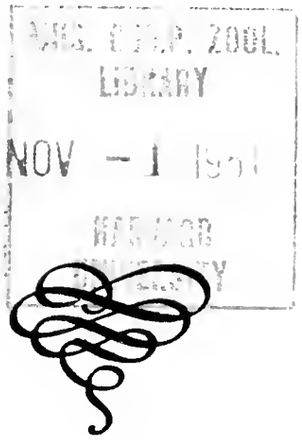

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Nearctic Mites of the Family Pseudoleptidae

By E. A. McGREGOR

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OUDEMANS (1938) created the family Trichadenidae which had been held to include the genera *Trichadenus* Rond. 1870, *Tenuipalpus* Donn. 1875, *Brevipalpus* Donn. 1875, *Phytoptipalpus* Trag. 1904, *Raoiella* Hirst 1924, *Phyllotetranychus* Sayed 1938, *Doliochotetranychus* Sayed 1938, and *Tegopalpus* Wom. 1940. All of these genera in the past have been placed in the family Tetranychidae. Sayed (1938) proposed the subfamily Pseudotetranychinae to include *Tenuipalpus, Raoiella, Phyllotetranychus,* and *Dolichotetranychus.* Baker (1945) placed *Trichadenus, Brevipalpus, Tenuipalpus, Raoiella, Tegopalpus,* and *Phyllotetranychus* in the family Trichadenidae, pointing out that this family predates Sayed's Pseudotetranychinae. Recently, however, Baker established (as explained in correspondence) that *Pseudoleptus* is distinct from *Trichadenus,* contrary to Oudemans' earlier belief that these genera are synonyms. Baker's conclusion supports Sayed's (1942) belief that the two genera are not identical. Consequently, since *Pseudoleptus* must be restored, the name Pseudoleptidae Oudem. (1928), the earliest family name for this mite complex, should be used.

Previous to 1900, when Banks described "*Stigmaeus floridanus*" from pineapple from Florida, mites of this family were unreported from the United States. To the present time, only eight species in this family have been reported from this country. Due to the nature of the descriptions and illustrations of some of these species, as well as to the lack of critical study of their morphology, confusion has existed in the taxonomy of this group of mites.

[1] *Retired*

The present author (1914) attempted to reveal certain structural characters of importance, and more recently Geijskes (1939) and Sayed (1938 and 1942) have extended the knowledge of the morphological features of these mites.

In the present paper the author has restudied the known Nearctic species in this group and describes five new species occurring in the United States and Canada.

Geijskes (1939) states that the species of *Tenuipalpus* and *Brevipalpus* occur chiefly in subtropical and tropical regions, and that in cooler climates they are found, as a rule, in hothouses where they had been introduced on tropical plants. These observations are supported by the data on the distribution of our representatives of this family in the United States where all known species, with the exception of one described from Iowa, occur in the warmer portions of the country. On the other hand, it has been the writer's experience that the species under his observation have reached their peak of abundance with the approach of cool weather, usually in September or later.

Most mites of this group in the United States, when occurring on foliage, feed by preference on the under side of the leaves, usually close to the main veins. They are mostly gregarious, occurring in close colonies, and at times become so numerous as to overrun the foliage or fruit. Their feeding does not result in conspicuous blotches, as is the case with the spinning mites, but leads usually to a stippling of the leaves. These mites evidently do not possess the spinning ability, and the writer has never observed webbing on foliage infested by them.

The life history of the pseudoleptid mites, based on one species studied (McGregor 1916), agrees roughly with that of the spider mites. In the female there is a 6-legged larval stage, two nymphal stages, and the adult. The male has but one nymphal stage, is smaller than the female, the abdomen is more constricted, a little more attenuate, and the hairs are relatively longer. The populations frequently are restricted to female individuals, and the occurrence of males appears to be seasonal.

The immature stages differ in the following respects from the mature mites: The anterior cephalothoracic plate appears to be lacking. The reticulations of the dorsum seem first to appear in the second nymphal stage, but not distinctly. The dorsal and marginal setae are relatively more conspicuous and more pinnate in the immature stages than in the adults. Usually the preadult

stages have the abdomen noticeably emarginate laterally. The constriction between the trochanter and femur is usually hardly noticeable prior to the adult stage.

Taxonomic Features

In the taxonomy of this group the writer has employed a number of structural features, some of which have not been utilized previously.

Body proportions: The shape of the entire body, of the cephalothorax[1], of the abdomen[1], and the length and contour of the legs are all features of importance.

Frontal plate: This is a semihyaline, free projection overlying the rostrum and, in some species, trochanters I and II. Its upper surface may be pebbled or finely stippled. The anterior profile varies somewhat within a species, but the number of lobes and general outline is fairly constant for each species.

Palpus: The number of the segments of the palpi vary between genera, and the shape and length of these segments, and the presence or absence of certain of their setae are employable characters.

Tarsal appendages: The terminal appendages of the tarsi are complex, and are observed with difficulty. An attempt is made to describe these features in some detail but, due to the basic similarity of these structures between species, not too much dependence should be placed on them.

Dorsal setae: The dorsal setae of the cephalothorax and abdomen vary greatly in shape, length, and in being simple, pectinate, or foliaceous. The number of setae along the margin of abdomen seems to be constant for a species, and varies between species.

Dorsal reticulation: In those species with the dorsum reticulated, the areolae vary in their proportions. The writer has selected for taxonomic use the area midway between the lateral margin and the median axis of the cephalothorax. When a series of these areolae are measured, their mean proportions have specific value.

Abdominal stigmata: In the female of species of *Brevipalpus* a pair of stigmata open dorsally close behind the first pair of submedian setae. They may be deeply or faintly dusky-bordered, or without a border. In some species a pair of similar stigmata occur on the cephalothorax opposite the mandibular plate.

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[1]*Some authors employ the terms "propodosoma" and "hysterosoma," respectively, for the portions of the body lying anterior to and posterior to the main suture.*

Genito-anal field: The position of the transverse series of setae on the genital shield, and the number of setae bordering the anus have specific significance.

Ventral postcoxal region: An area on the ventral surface of the cephalothorax immediately behind coxae II is conspicuously reticulated in most species of *Brevipalpus*. The number of these areolae appears to be significant. In *Pentamerismus* and *Tenuipalpus* this area is striated.

Key to the Genera

1. Body twice as long as wide; without an anterior plate projecting free from cephalothorax; coxae III situated well behind main body suture; tip of tarsi with two obscure claws borne well distad of onychium; a pair of clavate setae on top of rostrum.....*Trichadenus* Rondani

   Body less than twice as long as wide; with an anterior plate projecting free from cephalothorax; coxae III situated close to main body suture; tip of tarsi with two prominent claws, borne on onychium; no clavate setae on rostrum 2

2. Palpus with three segments; abdomen of both sexes abruptly narrower than cephalothorax; second marginal hair from caudal tip of abdomen long, whiplike; dorsal integument striated; a pair of semiplumose hairs on venter of rostrum.....*Tenuipalpus* Donnadieu

   Palpus with four or five segments; abdomen of female with marginal outline continuous with that of cephalothorax; margin of abdomen without long, whiplike hair; dorsal integument reticulated; hairs on venter of rostrum simple 3

3. Palpus with four segments; anus bordered by two pairs of setae; anterior free plate usually with more than two frontal lobes; body strongly flattened

   Brevipalpus Donnadieu

   Palpus with five segments; anus bordered by three pairs of setae; anterior free plate with only two frontal lobes; body convex.....*Pentamerismus*, new genus

Genus Tenuipalpus Donnadieu, 1875

Tenuipalpus Donnadieu, Recherches pour servir à l'histoire des Tetranyques, Lyon, p. 111, 1875.

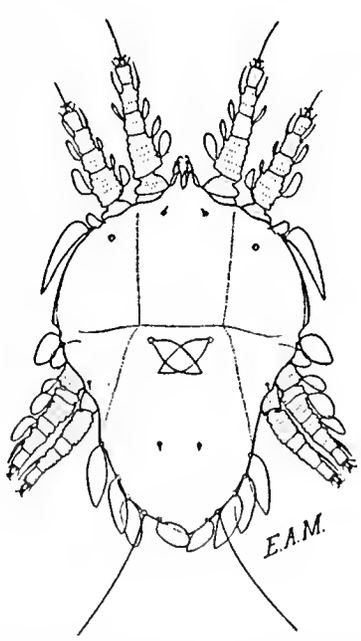
Body flattened, cephalothorax broad, abdomen rather abruptly

narrowed. Dorsal integument not reticulated, but with scattered striations. Marginal setae of cephalothorax and abdomen rather conspicuous; humeral setae of cephalothorax lanceolate to ovate-lanceolate; humeral setae of abdomen from inconspicuous to ample-ovate, usually shorter than humeral setae of cephalothorax. Four pairs of lanceolate to ovate-lanceolate setae and a long, whip-like hair borne marginally on posterior half of abdomen. Legs I, II, and III with conspicuous setae. Palpus of three segments in simple series; second segment the largest, with a strong hair; the last segment very small, with one or two setae. Cephalothorax anteriorly with a free projecting plate. The type of the genus is *T. palmatus* Donn.

Baker (1945) has recently published on the genus *Tenuipalpus* Donn., and included in his paper four foreign species (one of these reported also from Florida), and one species taken in South Carolina. No members of this genus, as now conceived, had been reported previously from the United States. Since the present author has not studied this genus in the past, the present treatment of *Tenuipalpus* is limited to a redescription of the genus and of the type species, and to a summary of Baker's information on the two species known from this country.

Tenuipalpus palmatus Donnadieu
Text Fig. 1

Tenuipalpus palmatus Donnadieu, Recherches pour servir à l'histoire des Tetranyques, Lyon, pp. 112-114, pls. 1, II, figs. 1-19, 1875.



Text Fig. 1. Female of *Tenuipalpus palmatus* Donn., dorsal view.

The following description is based on the study of two individuals on a slide in the collection of the United States National Museum, originally from the Berlese Collection, loaned to the author.

Female: Cephalothorax broad, abdomen rather abruptly narrowed. Dorsal integument with scattered striations. Marginal setae of body mostly large, ovate-lanceolate to lanceolate; humeral setae of cephalothorax large, lanceolate, arising just behind a projecting plate; humeral setae of abdomen ample, ovate, situated just before a projecting plate which is smaller than the seta; four pairs of large ovate-lanceolate setae borne marginally on the posterior half of abdomen, and a long, whiplike hair each side between the third and fourth of these lateral setae. Legs I, II, and III with conspicuous ovate to ovate-lanceolate setae; ovate seta of trochanter III smaller than the abdominal humeral scale. A pair of very fine, simple hairs dorsally near front of cephalothorax overlying coxae I. A pair of ample, ovate-lanceolate setae submedially just behind the main body suture; a pair of very fine, simple hairs near margin of abdomen overlying coxae IV; a similar pair of hairs submedially on abdomen opposite the first pair of large marginal setae. Eyes considerably within body margin, opposite base of humeral seta of cephalothorax. Tip of tarsus bearing two claws with longish tenent hairs at each side, and a median pulvillus bearing a double pectinate series of short tenent hairs; a very long hair borne dorsoterminally. A deep constriction between trochanter and femur, especially on legs I and II; leg segments rugose. Palpi with three segments; the second much the largest, bearing a strong, semiplumose seta; last segment small, apparently with one short terminal seta. A semihyaline plate projecting free from the cephalothorax anteriorly; deeply incised medially to form two acute lobes; a second pair of inconspicuous lobes overlying space between coxae I and II.

Male: The abdomen narrower than in female; the foliaceous setae lacking on abdomen behind the main suture, but with fine, short, bradlike setae. Submedian lobes of anterior cephalothoracic plate a little wider than in female. Last segment of palpi very small. Otherwise there is little difference between the sexes.

The listed food plants are *Viburnum tinus* and *Citrus* spp.

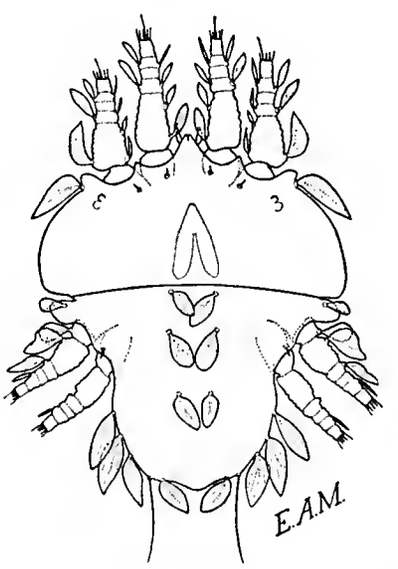
Commonly reported in southern Europe.

Baker (1945) states that mites from *Magnolia,* Jacksonville, Fla., from oak, Cocoa Beach, Fla., and mites intercepted at San Francisco from Guatemala, appeared to be *T. micheli* Lawrence.

Specimens of the former mite were sent to Lawrence, who compared them with *micheli* of South Africa, and reported in correspondence that they are quite distinct, especially in the absence in *micheli* of the dorsal, submedian, leaflike setae, and that the setae on the body margin and on the legs are acutely tipped in *micheli,* but somewhat round-tipped in the related American form. Baker suggested that the present author describe the latter species as new, and the description follows:

Tenuipalpus bakeri, new species
Text Fig. 2

Tenuipalpus micheli Lawrence, Baker, 1945, Ent. Soc. Wash. Proc. 47 (2): 35. Misidentification.



Text Fig. 2. Female of *Tenuipalpus bakeri,* new species, dorsal view.

Female: Cephalothorax broad, fully twice as broad as long; abdomen abruptly narrowed behind its humeral angles. Anterior margin of cephalothorax semihyaline, with five main projecting lobes, as follows: A median lobe between coxae I is slightly cleft into two acute secondary lobes; a lobe each side between coxae I and II; a rounded lobe projects laterally at each humeral angle. Marginal body setae mostly large, ovate-lanceolate to spatulate, all with tips subacute excepting those on abdominal humeral lobes, on trochanters III, and the peglike seta over coxae IV; humeral setae of cephalothorax large, ovate-lanceolate, arising at outer base of humeral lobe; humeral setae of abdomen spatulate, arising on the humeral lobe which is larger than the seta; four pairs of large, ovate-lanceolate setae borne marginally on posterior half of abdomen, and a long whiplike hair each side between the third and fourth of these lateral setae. A pair of very small, peg-

like setae overlying coxae I, II, and IV. Three pairs of ample, ovate to ovate-lanceolate setae submedially on abdomen between main suture and a point even with first lateral seta, these all with rounded tips. Eyes well within body margin behind coxae II. Palpi inconspicuous, of three segments, second segment with a semi-plumose seta, the last segment bearing a longish and a short hair. Legs I, II, and III with conspicuous, elliptical to ovate-lanceolate setae, all blunt tipped except outer basal seta of femora II, which is rather acute-tipped; ovate seta of trochanter III only slightly smaller than abdominal humeral lobe. Leg segments rugose; a deep constriction between trochanter and femur, especially on legs I and II. Appendages on tip of tarsi evidently similar to those of *T. palmatus,* as described and figured. Venter of female with hairs and setae as figured by Baker.

Male: Abdomen behind humeral lobes more abruptly narrowed than in female, its width less than half that of cephalothorax. Distribution and structure of dorsal and marginal body setae and of leg setae similar to those of female, except that the leaflike dorsal, submedian abdominal setae are replaced in the male by minute, peglike setae; ovate seta on trochanter III about equal to the abdominal humeral lobe. Venter with setae evidently resembling those on venter of female. Palpi similar to those of female, except that second segment appears to be somewhat more swollen. Aedeagus and penis both appear to be almost filamentous.

Type material: U. S. Nat. Museum No. 1704; 5 females and 1 male.

Type locality: Cocoa Beach, Fla.

Distribution: Florida and Guatemala.

Food plants: Magnolia sp., oak, *Sobralia macrantha,* Spanish bayonet *(Yucca gloriosa).*

Tenuipalpus carolinensis Baker

Tenuipalpus carolinensis Baker, Proc. Ent. Soc. Wash., vol. 47, pp. 35-36, figs. 5, 5A, 1945.

This species was described from a single specimen taken from goldenrod at Batesburg, S. C., by "H. F. W." (probably H. F. Wilson).

Female: Last segment of palpus with only one seta. Shield over rostrum long, simple. The two pairs of dorsal anterior hairs on propodosoma small, the humeral hairs long, lanceolate. All

hysterosomal hairs small except those on posterior margin; these four pairs large, lanceolate; also a single pair of long, simple hairs. Only one pair of long hairs opposite posterior coxae; hairs of coxae III and IV longish. A pair of long and a pair of short hairs on posterior venter of propodosoma; anterior ventral hairs long, simple. Tarsi apparently without claws (according to Baker, but this is doubtful), with three pairs of tenent hairs. Leg hairs strong, those on basal segments lanceolate; ventral hairs simple. Length including rostrum, 0.294 mm., width, 0.156 mm.

Baker considers *carolinensis* to be very close to *orchidarum* Oud.

Genus Brevipalpus Donnadieu, 1875

Brevipalpus Donnadieu, Recherches pour servir à l'histoire des Tetranyques, Lyon, p. 116, 1875.

Small, typically red mites, body usually much flattened, strongly chitinized, with dorsal surface reticulated. Body outline of female sagittate-oval to oval, with a free, overlapping plate anteriorly which is deeply cleft at apical point to form a pair of submedian lobes, and with one or more additional pairs of frontal lobes. Dorsal body setae usually short, serrate or pectinate (long in 1 species). The cephalothorax dorsally bears 3 pairs of setae, 1 pair at anterior margin over coxae I, 1 in front of and 1 behind the eyes. The abdomen dorsally with 3 submedian pairs of setae (4 pairs in 1 species), and with from 12 to 16 setae along the lateral margin. A well-defined suture separates the cephalothorax from abdomen. A conspicuous constriction between the trochanter and femur, especially on legs I and II, in the adults of all but one species. Two eye corneae on each side. Usually a longitudinal ridge along the entire dorsum. A pair of stigmata, usually dusky-bordered, open dorsally on the abdomen behind the first pair of submedian setae. The mandibles stylate and protrusile, basally forming a definite mandibular plate, which is subject to much movement forward and backward. Rostrum and palpi rather small and usually subequal, the former roughly triangular. Palpi with 4 segments, these in simple arrangement, the antepenultimate segment without a claw; last segment bearing 2 terminal simple hairs and a semiclavate seta. Legs short and stout, legs IV rarely extend beyond abdomen, surface of segments rugose; tarsi with 2 stout claws between which is a pulvillus; knobbed tenent hairs arise both from the claws and the pulvillus; tarsi I dorsally with a long, tactile hair, a clavate seta, and 5 or 6

additional terminal hairs. A chitin-bordered genito-anal field on venter, the anus subterminal, bordered by 2 pairs of setae. A funnel-shaped invagination, with longitudinal and transverse striations, occurs dorsally at front of cephalothorax and surrounds the anterior portion of the mandibular plate, when protruded.

The males of those species of *Brevipalpus* which have been studied are somewhat smaller and narrower than the females, the abdomen often is somewhat constricted laterally. A dorsal, transverse groove occurs between the main suture and tip of abdomen (not present in female). The setae are relatively longer than in female. A hornlike process occurs dorsally on the second segment of the palpi. Numerous stigmata in some species occur on the dorsum of cephalothorax and abdomen. Penis (where known) long, rod or stylet-shaped, projecting between a pair of caudal lobes. The type of the genus is *Brevipalpus obovatus* Donn., 1875. So far as known, this species does not occur in the United States.

Key to the Species of Brevipalpus

1. Areolae on cephalothorax laterad of mandibular plate mostly four times as long as wide.....*lewisi*, new species
   Areolae on cephalothorax laterad of mandibular plate mostly less than twice as long as wide..... 2

2. Dorsal body setae not pectinate or serrate
   californicus (Banks)
   Dorsal body setae pectinate or serrate..... 3

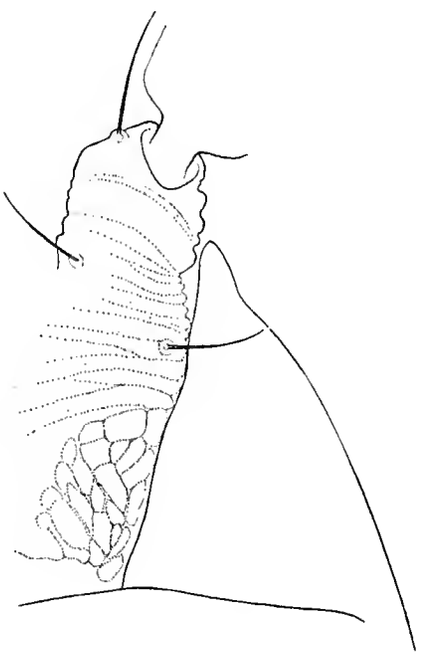
3. Dorsal body setae fully half as long as width of body; rostrum much exceeding the palpi.....*salviae*, new species
   Dorsal body setae much less than half as long as width of body; rostrum and palpi subequal..... 4

4. Number of lateral abdominal setae on each side, 7
   cardinalis (Banks)
   Number of lateral abdominal setae on each side, 6..... 5

5. Areolae on cephalothorax mostly wider than long; mandibular plate tapering forward from its hind third
   woglumi, new species
   Areolae on cephalothorax mostly longer than wide; mandibular plate not tapering much on hind four-fifths of its length, then abruptly narrowed.....*inornatus* (Banks)

Brevipalpus californicus (Banks), new combination
Text Fig. 3; Plate I

Tenuipalpus californicus Banks, Jour. N. Y. Ent. Soc., vol. 12, pp. 54, 55, pl. II, figs. 1-3, 1904.



Text Fig. 3. *Brevipalpus californicus* (Banks).
Postcoxal region of venter, showing structure of areolae.

Female: Length, 0.228 mm. Reddish in color, especially immature individuals, tending to become rufous amber with age. General shape of body from above ovate-sagittate, widest across posterior margin of cephalothorax, abdomen bluntly rounded behind. Greatest width of body two-thirds that of length; length of cephalothorax one-third that of body to anterior margin of cephalothorax which is somewhat narrowed toward the front. Projecting anteriorly free from cephalothorax and overlying trochanters I and II is a semihyaline, stippled plate with 3 pairs of lobes, as figured. Dorsal cuticular surface of body conspicuously reticulated, the areolae on cephalothorax laterad of mandibular plate average about one-third longer than wide. Two eye corneae each side sublaterally at humeral angle. Dorsally the cephalothorax bears 3 pairs of rather weak setae; 1 pair at anterior margin between coxae I, 1 just in front of and 1 just behind eyes. Abdomen bearing 20 very weak setae dorsally; 7 along each lateral margin from the main suture back to the caudal tip; 3 submedian pairs, the first near the main suture, the second and third pairs opposite the second and third marginal setae, respectively. All dorsal body setae appear to be simple, that is, un-

pectinate and unserrate. A pair of dusky-bordered pores open dorsally on the abdomen a short distance behind the main suture. Rostrum and palpi rather inconspicuous, the latter surpassing the former. Palpi composed of 4 segments; segment II much the largest, with a long pectinate seta anteriodorsally; segment III about three-fourths as thick as long, bearing laterally a weak hair and dorsally a strong seta fully as long as the segment itself; last segment of palpi only slightly longer than thick, bearing 3 terminal setae longer than the segment, one of which is subclavate. The mandibular plate about two and one-third times as long as wide, its greatest width at a point 29 per cent of its length from its hind margin, narrowed anteriorly to a rounded tip. Overlying the anterior portion of the mandibular plate and the base of the rostrum is a funnel-shaped chamber which evidently opens near the front of the cephalothorax, and may be part of the breathing system. The collar trachea extends downward and backward as a straightish tube, ending in a swollen chamber. Legs paler than body, but all tarsi reddish, as are also the palpi. Legs short, stout, the posterior pair barely reaching beyond the tip of abdomen; surface of segments rugose; a conspicuous constriction between the trochanter and femur, especially of legs I and II, resulting almost in a ball-and-socket articulation. Tarsi abruptly truncate near tip, then produced as a short "neck" bearing a pair of stout claws between which is a pulvillus. The detailed arrangement of the claw and pulvillus appendages are difficult to observe; 2 long tenent hairs arise on the outside and 1 on the inside of each claw, and a pectinate series of short tenent hairs arises from the pulvillus. Tarsus I dorsally bears subterminally a tactile hair longer than the segment, a clavate seta outside the latter borne on a tubercle, and about 5 additional subterminal hairs, one of which arises from a stout, cylindrical tubercle. The genito-anal shields are similar to those of *Brevipalpus lewisi,* as figured. The postcoxal sculptured area of venter containing about 24 areolae. Venter of rostrum bearing a pair of long hairs close to coxae I, and a pair of short hairs under first segment of palpi.

The male is unknown to the writer. It was not present in the many lots of mites collected from and near the type locality.

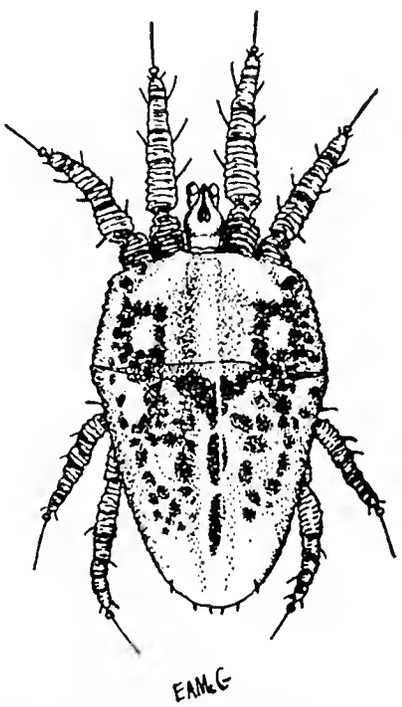
On orange peel, Redlands, Calif., 1903, collected by S. A. Pease. The type specimens have not been seen, but since all mites of this genus collected by the present author at Redlands and at numerous nearby localities have been identical, it may be

assumed that they are valid representatives of *californicus*. These many specimens have formed the basis of the study of this species.

Brevipalpus inornatus (Banks), new combination
Text Fig. 4; Plate II

Tenuipalpus inornatus Banks, Proc. Ent. Soc. Wash., vol. 14, p. 97, fig. 1, 1912.

Tenuipalpus bioculatus McGregor, Ann. Ent. Soc. Amer., vol. 7, pp, 354, 355, fig. 1, pl. 42, 1914.



Text Fig. 4. *Brevipalpus inornatus* (Banks). Female mite, dorsal view.

When the present author (1914) described *Tenuipalpus bioculatus,* Banks' type specimens of *T. inornatus* could not be found for study. The material that formed the type specimens of *bioculatus* appeared to differ substantially from Banks' description and figure of *inornatus.* Baker recently has compared the type specimens of *bioculatus* with mites on the type slide of *inornatus,* and in correspondence stated that he found no important differences. Accordingly, *bioculatus* is reduced to synonymy.

This species has been restudied with material collected from the type host and type locality through the kindness of Professor Franklin Sherman of Clemson College, S. C. The description follows:

Female: Length, 0.235 mm. Scarlet in color, often with 2 well-defined, blackish eyelike spots on cephalothorax. General shape

of body from above ovate-sagittate, widest between posterior angles of cephalothorax, abdomen rounded behind; body two-thirds as wide as long. Length of cephalothorax about one-third that of body to front margin of cephalothorax, the latter tapering somewhat anteriorly. Tangents to lateral and frontal margins of cephalothorax forming an angle of about 119°. A semihyaline, finely stippled plate, projecting free from the cephalothorax anteriorly and overlying the rostrum and trochanters I and II, has 3 pairs of frontals lobes, as figured. Dorsal cuticular surface of body conspicuously reticulated, the areolae on cephalothorax laterad of mandibular plate average fully one-fourth longer than wide. Two eye corneae on each side at humeral angle of cephalothorax, subequal in size. The cephalothorax dorsally bears 3 pairs of rather weak setae; 1 pair at anterior margin overlying coxae I, 1 just in front of and 1 just behind the eyes. Abdomen bearing 18 rather weak setae dorsally; 6 along each lateral margin from main suture back to caudal tip; 3 submedian pairs, the first near the main suture, the second and third pairs opposite the second and third marginal setae, respectively. All dorsal body setae are noticeably pectinate or serrate. A pair of pores, weakly bordered, open dorsally on the abdomen a short distance behind the main suture. Rostrum and palpi rather inconspicuous, the latter hardly surpassing the former. Palpi composed of 4 segments; segment II much the largest, with a long pectinate seta anteriodorsally; segment III fully two-thirds as thick as long, bearing laterally a hair which is as long as the segment, and dorsally a strong hair of almost equal length; last segment of palpi about one-third again as long as thick, bearing terminally 2 setae longer than the segment, and a nail-shaped seta equaling the segment. The mandibular plate is about two and one-fourth times as long as wide, its greatest width at a point 37 percent of its length from its hind margin, emarginate laterally at a point one-seventh its length behind its anterior tip, narrowly rounded in front. The structure of the anterior "funnel" is similar to that of *Brevipalpus lewisi,* as figured. Legs short, stout, the last pair when extended reaching a little beyond tip of abdomen; the 4 anterior tarsi blood red in life; surface of segments rugose; a conspicuous constriction between the trochanter and femur, especially of legs I and II, resulting almost in a ball-and-socket articulation. Tarsi abruptly truncate near tip, then produced as a short "neck" bearing a pair of stout claws between which arises the pulvillus. Knobbed tenent hairs arise both from the claws and the pulvillus, the number and detailed arrangement

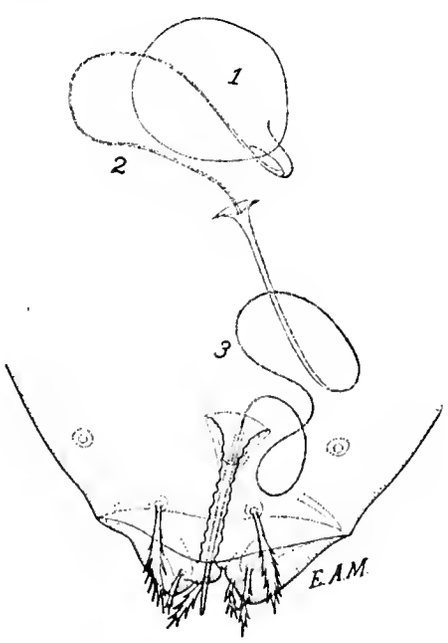
of which are difficult to observe; evidently 1 long tenent hair arising on each side of each claw, and paired pectinate series of shorter tenent hairs arising from the pulvillus. Tarsus dorsally bears subterminally a tactile hair longer than the segment itself, a clavate seta outside the latter, borne on a tubercle, and about 6 additional subterminal hairs, 1 of which arises from a stout, cylindrical tubercle. The chitin-bordered genito-anal field is somewhat similar to that shown for *Brevipalpus lewisi,* but differs from the latter in that the transverse series of 4 setae on the genital shield lies nearer its posterior border. Anus bordered by 2 pairs of setae. The postcoxal ventral sculptured area with about 55 areolae. Venter of rostrum bearing a pair of long hairs under base of coxae I, and a pair of short hairs under segment I of palpi.

Male: The male is noticeably smaller than the female, the abdomen is somewhat narrowed behind the cephalothorax, and more attenuate than in the female. The legs of the male are relatively longer, less colored, and the hairs are more conspicuous.

From goldenrod, Batesburg, S. C., collected by H. F. Wilson. Collected also at Batesburg by the present author (1916) from privet, on which it often became very abundant and injurious.

Brevipalpus cardinalis (Banks), new combination
Text Fig. 5; Plate III

Tenuipalpus cardinalis Banks, Proc. Ent. Soc. Wash., vol. 14, No. 2, p. 96, fig. 8, 1912.



Text Fig. 5. *Brevipalpus cardinalis* (Banks).
Dorsal view of male sex apparatus:
1, Seminal vesicle; 2, ejaculatory duct; 3, penis.

Female: Length, 0.236 mm. Body and legs of mite nopal red in color, which is especially deep over the mandibular plate; triangular area at front of cephalothorax flesh color; numerous blackish spots distributed dorsally submarginally. General shape of body from above narrowly ovate, widest just behind main suture, abdomen rounded at caudal end; body six-tenths as wide as long. Length of cephalothorax about one-third that of body to anterior margin of cephalothorax, the latter tapering anteriorly. A thin reticulated plate projecting free from the cephalothorax anteriorly and overlying the rostrum and trochanters I and II, has 2 pairs of frontal lobes and a pair of bosses, as figured. Dorsal cuticular surface of body conspicuously reticulated, the areolae on the cephalothorax laterad of mandibular plate average fully three-fourths again as long as wide. Two eye corneae on each side at humeral angle of cephalothorax. The cephalothorax dorsally bears 3 pairs of strongly pectinate setae, longer than usual for mites of this genus; 1 pair at anterior margin overlying coxae I, 1 just in front of and 1 just behind eyes. Abdomen bearing 20 strongly pectinate setae dorsally; 7 along each margin from main suture back to caudal tip; 3 submedian pairs, the first near the main suture, the second and third pairs opposite the second and third marginal setae, respectively. A pair of smoky-bordered pores open dorsally on the abdomen a short distance behind the main suture. Rostrum and palpi rather inconspicuous and of equal length. Palpi composed of 4 segments; segment II much the largest, with a long simple seta anteriodorsally; segment III six-tenths as thick as long, bearing laterally a hair fully as long as the segment, and dorsally a similar hair; last segment of palpi about one-third longer than thick, bearing terminally 2 setae longer than the segment, and subterminally a subclavate seta also exceeding length of segment. The mandibular plate is about two and one-fourth times as long as wide, its greatest width at a point only 30 per cent of its length from its hind margin, somewhat pointed in front. The arrangement of the anterior "funnel" is similar to that of *Brevipalpus lewisi*, as figured. Legs short, stout, the last pair when extended barely reaching tip of abdomen; surface of segments rugose; a constriction between the trochanter and femur, especially of legs I and II. Tarsi truncate near tip, then produced as a short "neck" bearing a pair of stout claws between which arises the pulvillus. Knobbed tenent hairs arise both from the claws and the pulvillus, the number and details of which are very difficult to observe; 1 or 2 longish tenent

hairs arise on each side of each claw, and paired pectinate series of short tenent hairs arise from the pulvillus. Tarsi I dorsally bears subterminally a tactile hair longer than the segment itself, a clavate seta outside the latter, borne on a tubercle, and about 5 additional subterminal hairs, 1 of which arises from a stout, cylindrical tubercle. Ventrally, on the hind portion of abdomen is a chitin-bordered genito-anal field; 2 setae situated before the genital shield, 4 setae in a transverse row on the hind third of this shield, and a pair of submedian setae lie on either side of the anus; all these setae are serrate or pectinate. The postcoxal area of venter (usually reticulated in this genus) appears to be without areolae. Venter of rostrum bearing a pair of long hairs behind coxae I, and a pair of short setae under base of segment II of palpi.

Male: Length, 0.196 mm. Shape of body from above narrowly ovate, about twice as long as wide, widest across hind portion of cephalothorax; abdomen slightly constricted at a point one-third its length behind main suture, with an indistinct groove dorsally between the emarginations. Marginal abdominal setae relatively longer than in female. Fourteen conspicuous dusky-ringed pores or stigmata on the dorsum, two pairs on the cephalothorax and five pairs on the abdomen. Palpi with a horn-shaped spur dorsally on second segment. Genital apparatus consisting of a large, spherical seminal vesicle from which arises a filamentous ejaculatory duct; the latter leads into a sheath through a funnel-shaped opening, and appears to be continuous with a long, almost filamentous penis; the latter enters an expanded opening near the base of the caudal lobes, and emerges caudally through a structure resembling a sheath or aedeagus.

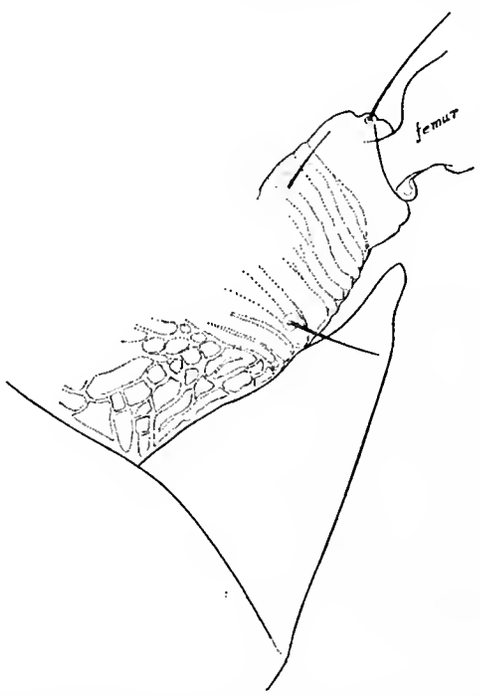
On bark of ash tree, Phoenix, Ariz., collected by Morrill.

The author's description and drawings are based on studies of a single specimen from ash, Glendale, Ariz., collected by the author, and a large series of speciments from ash, Bakersfield, Calif., collected by C. S. Morley.

Brevipalpus lewisi, new species
Text Fig. 6; Plate IV

Female: Length, 0.244 mm.; carrot to salmon red in color. General outline of body from above ovate-sagittate, widest across posterior margin of cephalothorax, abdomen bluntly rounded behind. Greatest width of body slightly less than two-thirds that of length; length of cephalothorax slightly less than one-third

that of body to anterior margin of cephalothorax which is somewhat narrowed toward the front. A semihyaline stippled plate projecting free from the cephalothorax anteriorly and overlying trochanters I and II has 4 pairs of frontal lobes, as figured. Dorsal cuticular surface of cephalothorax and abdomen conspicuously reticulated, the areolae on cephalothorax laterad of mandibular plate average about 4 times as long as wide. Two eye corneae on each side sublaterally at humeral angle of cephalothorax. The



Text Fig. 6. *Brevipalpus lewisi,* new species. Sculpturing on postcoxal region of venter.

cephalothorax dorsally bears 3 pairs of rather weak setae; 1 pair at anterior margin between coxae I, 1 just in front of and 1 just behind eyes. Abdomen bearing 20 weak setae dorsally; 7 along each lateral margin from main suture back to caudal tip; 3 submedian pairs, the first near the main suture, the second and third pairs opposite the second and third marginal setae, respectively. All dorsal body setae are weakly pectinate or serrate. A pair of dusky-bordered pores open dorsally on the abdomen not far behind the main suture. Rostrum and palpi rather inconspicuous, the latter slightly surpassing the former. Palpi composed of 4 segments; segment II much the largest, with a long pectinate seta anteriodorsally; segment III about three-fourths as thick as long, bearing laterally a hair which is longer than the segment, and dorsally a slightly shorter seta; last segment of palpi about one-half again as long as thick, bearing 2 terminal setae longer than the segment, and a shorter subclavate seta. The mandibular plate about two and one-half times as long as wide, its greatest

width at a point 34 per cent of its length from its hind margin, narrowed anteriorly to a rounded tip. The funnel-shaped invagination overlying the base of the rostrum is as figured. The collar trachea extends downward and backward as a straightish tube, ending in a swollen chamber. Legs short, stout, the last pair reaching the hind margin of abdomen when extended; surface of segments rugose; a conspicuous constriction between the trochanter and femur, especially of legs I and II, resulting almost in a ball-and-socket articulation. Tarsi abruptly truncate near tip, then produced as a short "neck" bearing a pair of stout claws between which arises the pulvillus. Knobbed tenent hairs arise both from the claws and the pulvillus, the number and details of which are difficult to observe; 1 or 2 longish tenent hairs arise on each side of each claw, and paired pectinate series of short tenent hairs arise from the pulvillus. Tarsi I dorsally bears subterminally a tactile hair longer than the segment itself, a clavate seta outside the latter, borne on a stout tubercle, and about 6 additional hairs, 1 of which arises from a stout cylindrical tubercle. Ventrally on hind portion of abdomen is a chitin-bordered genito-anal field; 2 setae situated before the genital shield, 4 setae in a transverse row near the middle of this shield, and a pair of submedian setae on either side of the anus. The postcoxal ventral sculptured area with about 26 areolae. Venter of rostrum bearing a pair of long hairs under base of coxae I, and a pair of short hairs under base of segment II of palpi.

The male is unknown to the writer.

Type slide: Catalogue No. 1527, United States National Museum.

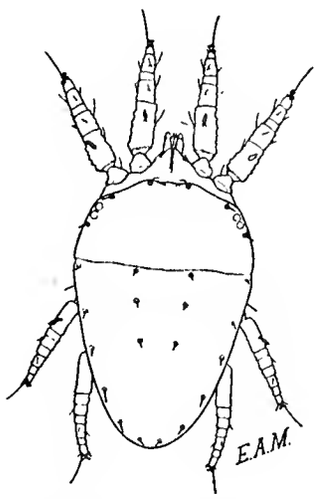
The type material is from Porterville, Calif., November 1, 1942, on lemon fruits, collected by H. C. Lewis.

Mr. Lewis has collected this mite on several occasions from the type locality and from other points in Tulare County. Lewis (1944) discussed the occurrence, distribution, extent of injury, and illustrated the damage to lemon fruits by this mite.

Brevipalpus woglumi, new species
Text Fig. 7; Plate V

Female: Length, 0.238 mm. Scarlet red in color. General shape of body from above ovate-sagittate, widest across main suture, abdomen bluntly rounded behind, greatest width of body slightly more than two-thirds its length; length of cephalothorax about one-third that of body to anterior margin of cephalothorax,

the latter narrowed toward the front. A semihyaline finely stippled plate projecting free from cephalothorax and overlying trochanters I and II has 3 pairs of frontal lobes, as figured; a small, hornlike projection also arises each side laterad of the rostrum. Dorsal integument of body conspicuously reticulated, the areolae on cephalothorax laterad of mandibular plate average slightly wider than long. Two eye corneae on each side at humeral angle of cephalothorax, the posterior one slightly larger. The cephalo-



Text Fig. 7. *Brevipalpus woglumi*, new species. Dorsal view of female mite.

thorax dorsally bears 3 pairs of rather weak setae; 1 pair at anterior margin overlying coxae I, 1 just in front of and 1 just behind eyes. Abdomen bearing 18 weak setae dorsally; 6 along each lateral margin from main suture back to caudal tip; 3 submedian pairs, the first near the main suture, the second and third pairs opposite the second and third marginal setae, respectively. All dorsal body setae are weakly pectinate or serrate. A pair of dusky-bordered pores open dorsally on the abdomen a short distance behind the main suture. Rostrum and palpi rather inconspicuous, the latter slightly surpassing the former. Palpi composed of 4 segments; segment II much the largest, with a long pectinate seta anteriodorsally; segment III about six-tenths as thick as long, bearing laterally a hair which is nearly as long as the segment, and dorsally a strong hair as long as the segment; last segment of palpi fully one-half again as long as thick, bearing terminally 2 setae longer than the segment, and a subclavate seta equaling the segment. The mandibular plate about two and one-half times as long as wide, its greatest width at a point 36 percent of its length from its hind margin, tapering to a very narrow, rounded anterior tip. Overlying the anterior portion of mandibular plate and base of rostrum is a funnel-shaped invagination

opening near front of cephalothorax, similar to that of *Brevipalpus lewisi,* as figured. Legs short, stout, the last pair when extended reaching a little beyond the hind tip of abdomen; surface of segments rugose; a conspicuous constriction between the trochanter and femur, especially of legs I and II, resulting almost in a ball-and-socket articulation. Tarsi abruptly truncate near tip, then produced as a short "neck" bearing a pair of stout claws between which arises the pulvillus. Knobbed tenent hairs arise both from the claws and the pulvillus, the number and details of which are difficult to observe; 1 or 2 long tenent hairs arise on each side of each claw, and paired pectinate series of short tenent hairs arise from the pulvillus. Tarsi I dorsally bears subterminally a tactile hair longer than the segment, a clavate hair outside the latter, borne on a stout tubercle, and about 5 additional subterminal hairs, 1 of which arises from a stout, cylindrical tubercle. The ventral chitin-bordered genito-anal field is rather similar to that of *Brevipalpus lewisi,* as figured, but in the case of the transverse row of setae on the genital shield, the 2 middle setae arise near the hind border of the shield. Anus bordered by 2 pairs of setae. The postcoxal ventral sculptured area with about 32 areolae. Venter of rostrum bearing a pair of long hairs close to coxae I, and a pair of short hairs under base of segment II of palpi.

The male is unknown to the writer.

Type slide: Catalogue No. 1528, United States National Museum.

The type material is from Spring Valley, San Diego County, Calif., October 20, 1943, on lemon fruits, collected by R. S. Woglum. This mite also was collected at Escondido, Calif., from lemon by J. R. LaFollette. It is an intensely scarlet mite and retained its typical color for weeks in laboratory rearings, under which conditions individuals of *Brevipalpus lewisi* took on a pale salmon color.

These mites could be found on lemon foliage, but were more prevalent on the lemon fruits, especially near the calyx, and caused some stippling of the rind.

Brevipalpus salviae, new species
Plate VI

Female: Length, 0.21 mm. General shape of body from above ovate-sagittate, widest immediately behind the main suture, abdomen rounded behind, body five-eighths as wide as long.

Length of cephalothorax about one-third that of body to front margin of cephalothorax; the cephalothorax tapering strongly to the narrow, slightly concave frontal margin. A semihyaline plate with cobbled surface projecting free from the cephalothorax anteriorly, overlying the rostrum and trochanters I and II, has a pair of long submedian lobes and a pair of inconspicuous lobes just laterad of these. Dorsal integument of body conspicuously reticulated, the areolae on cephalothorax laterad of mandibular plate averaging about one-third longer than wide. Two eye corneae on each side at middle of lateral margin of cephalothorax. Dorsally the cephalothorax bears 3 pairs of long, conspicuous setae which are armed with secondary spines; 1 pair at anterior margin overlying trochanters I, 1 sublaterally in front of eyes, and 1 laterally behind eyes. Abdomen bearing dorsally 20 setae similar to those on cephalothorax; 6 each side submarginally from main suture back to caudal tip; 4 submedian pairs on the anterior two-thirds of abdomen; most of the dorsal setae fully half as long as the greatest width of body. The dorsal abdominal pores appear to be lacking. Rostrum and palpi exceptionally long, the digiti fixi much exceeding the latter, and reaching to tibiae of legs I. Palpi composed of 4 segments; segment II the longest, with a long hair dorsally; segment III nearly as thick as long, bearing a long hair dorsally and 1 laterally, both about three times as long as the segment; last segment of palpi small, barely longer than thick, bearing terminally 2 setae much longer than the segment, and a dactylar seta about equaling the segment. The mandibular plate is slightly more than twice as long as wide, its greatest width at a point 26 per cent of its length from its hind margin, tapering strongly anteriorly to an unnotched tip. The structure of the anterior "funnel" is similar to that of *Brevipalpus lewisi*, as figured. The collar trachea consists of a straightish tube which expands into an oval terminal chamber. Legs short, rather stout, the last pair when extended reaching caudal tip of abdomen; surface of segments somewhat rugose; a rather weak constriction between the trochanter and femur of legs I and II; plumose setae dorsally on segments III, IV and V of legs I and II, and on segment III of legs III. Tip of tarsi bearing a pair of claws between which is a pulvillus. Tip of tarsi of legs I with a longish tenent hair arising at each side of each claw; paired series of short tenent hairs arise from the pulvillus; a long tactile hair arises on the tarsus dorsally, and a clavate seta arises from a tubercle near the base of the latter; at least 5 additional setae near the tip. The

genital plate about as usual, with a transverse series of 4 setae; the anus is bordered on each side by 2 setae, the anterior pair being simple, the posterior pair pinnate. The postcoxal area of the venter nonreticulated. Venter of rostrum with 2 long simple hairs between coxae I, and a pair of short hairs even with base of segment II of palpi.

Male: Length, 0.16 mm. Shape of body from above similar to that of female. The outline of the anterior cephalothoracic plate differing slightly from that of female in that the submedian lobes are shorter. A crease resembling a secondary suture is visible dorsally one-third the length of the abdomen behind the main suture. The dorsal setae are similar to those of female in shape and distribution. The second segment of palpi bears a hornlike spur in place of the long, tactile hair of the female. Viewed from above, the penis appears to be styliform.

Type slide: Catalogue No. 1529, United States National Museum.

The type material is from *Salvia* sp., Santa Paula, Calif., July 17, 1937, collected by workers of the California Citrus Experiment Station.

Pentamerismus, new genus

The genus *Pentamerismus* is characterized by the five-segmented palpus; the body is not greatly flattened, but arched dorsally, and usually widest over coxae IV; anterior cephalothoracic plate with one pair of lobes, these submedian; the anus is bordered by three pairs of setae; postcoxal area of venter without reticulations. The type of the genus *Pentamerismus* is here designated as *Tenuipalpus erythreus* Ewing.

A Key to the Species of Pentamerismus

1. Number of pairs of marginal abdominal setae, 8; segment II of palpi without setae; cephalothorax with all dorsal setae clavate-plumose.....*erythreus* (Ewing)

   Number of pairs of marginal abdominal setae, 7; segment II of palpi with a strong hair dorsally; dorsal setae of cephalothorax not plumose..... 2

2. The last six lateral abdominal setae plumose; areolae on dorsum laterad of mandibular plate average fully three times as long as wide; femora I dorsally with plumose seta .....*canadensis,* new species

   The last six lateral abdominal setae not plumose; areolae on dorsum laterad of mandibular plate average little

longer than wide; femora I dorsally with a lanceolate-pectinate seta .....*oregonensis,* new species

Pentamerismus canadensis, new species
Plate VII

Female: Length, 0.29 mm. An oval mite, broadly rounded in front and behind; widest over legs IV. Length to front of cephalothorax about one-half again greater than width; length of cephalothorax about one-third that of body. A much reduced semihyaline plate projecting free from the cephalothorax anteriorly, lying entirely between legs I, and consisting of a median pair of narrow lobes, these striated. Dorsal integument of body reticulated, the areolae on cephalothorax laterad of mandibular plate averaging fully three times as long as wide. One perfect and 1 imperfect eye cornea on each side sublaterally, situated well behind the humeral angle of cephalothorax. Dorsally the cephalothorax bears 3 pairs of very small, hardly pectinated setae; 1 frontal pair over trochanters I, 1 over trochanters II, and 1 behind and laterad of the eye corneae. Abdomen bearing 24 setae dorsally; 7 along each lateral margin from the main suture back to caudal tip, all but the anteriormost ovate-foliaceous; a transverse series of 4 very weak, evidently simple, setae near the main suture, a transverse series of 4 similar setae even with coxae IV, and 2 similar submedian setae even with the tips of legs IV. The dorsal abdominal pores appear to be lacking. Rostrum and palpi small, subequal. Palpi composed of 5 segments; segment II the largest, with a strong seta dorsally; segment IV with a strong seta above, longer than the segment, and a bristle laterally; last segment about as wide as long, probably with 2 terminal setae longer than the segment, and a shorter subterminal nail-shaped seta. The mandibular plate about three-fourths again as long as wide, its greatest width at a point one-fourth its length from its hind margin, tapering anteriorly to an unnotched tip. A funnel-shaped invagination opens anteriorly over base of rostrum. Legs short, stout, somewhat rugose transversely; legs I and II only slightly constricted between the trochanter and femur; legs III and IV largely concealed from view when the mite is viewed from above; the last pair failing by much to reach caudal end of abdomen. Tarsi bearing a pair of stout claws from the outer and inner face of which apparently arises a tenent hair longer than the claw; between the claws is a pulvillus lined on each side with a pectinated series of shorter tenent hairs; tarsi I and II dorso-terminally with 2 tactile hairs longer than the segment

itself, and a clavate seta and several additional setae arise subterminally. (The available specimens are mounted so that the details of the tarsal appendages are difficult to observe.) The ventrally placed genital and anal shields resemble those of *Pentamerismus oregonensis,* as figured, there being 3 pairs of setae bordering the anus. The postcoxal area of venter is without reticulations, but with transverse striations.

Males are unknown to the writer.

Type slide: Catalogue No. 1530, United States National Museum.

Described from three female specimens on *Thuya* sp. from British Columbia (intercepted at Seattle, Wash.). This mite had been identified as *Tenuipalpus coronatus* (C. & F.) of Europe; but, on the basis of the redescription and figures of *coronatus* by Berlese, the two species appear to be distinct and can be distinguished as follows:

coronatus: Body widest behind legs IV, tapering from that point forward rather strongly to humeral angles, with straightish sides; truncated in front. Lateral abdominal setae oblanceolate-spatulate. Legs with simple setae. Palpi with second segment devoid of hairs.

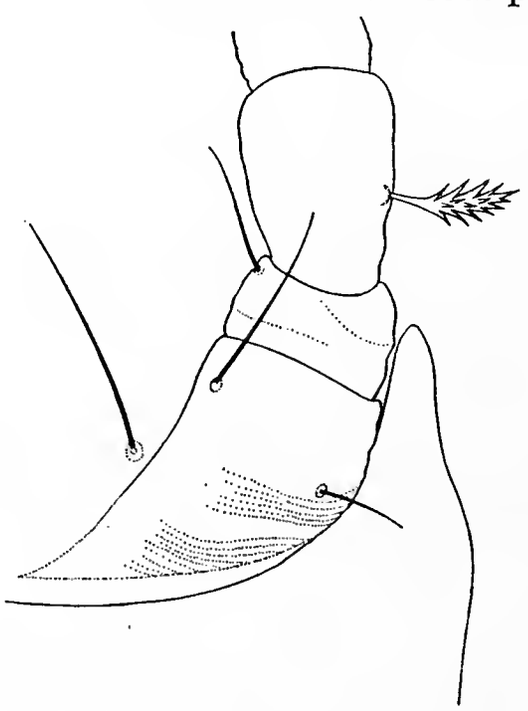
canadensis: Body widest opposite legs III, not tapering strongly anteriorad of that point to humeral angles, with an even curvature; not truncated in front. Lateral abdominal setae ample-ovate. Legs I and II with clavate, or spatulate, setose setae on femora. Palpi with a strong hair on second segment.

Pentamerismus erythreus (Ewing), new combination
Text Fig. 8; Plate VIII

Tenuipalpus erythreus Ewing, Bul. Amer. Mus. Nat. Hist., vol. 37, p. 152, pl. I, fig. 24, 1917.

Female: Length, 0.24 mm. An oval, red mite; broadly rounded behind and in front; widest over legs III; body convex above, almost one-third as thick as length of body to front of cephalothorax. Greatest width of body fully three-fourths that of length; length of cephalothorax three-tenths that of body. A greatly reduced semihyaline plate projecting free from cephalothorax anteriorly, lying entirely between legs I, and consisting mainly of a pair of narrow lobes, the upper surface palisade-sculptured. Dorsal integument of body reticulated, the areolae

laterad of mandibular plate average several times longer than wide. One perfect and 1 imperfect eye cornea on each side sublaterally, well behind the humeral angle of cephalothorax. Dorsally the cephalothorax bears 3 pairs of conspicuous, plumose setae; 1 pair at anterior border over coxae I, 1 in front of eyes, and 1 laterad of imperfect eye. Abdomen bearing 26 setae dorsally; 8 along each lateral margin from main suture back to caudal tip, all but the anteriormost foliaceous-plumose; a trans-



Text Fig. 8. *Pentamerismus erythreus* (Ewing). Sculpturing on the postcoxal region of venter.

verse series of 4 weak, simple setae near the main suture, a transverse series of 4 similar setae even with coxae IV, and 2 submedian setae overlying the tips of legs IV. The dorsal abdominal pores appear to be lacking. Rostrum and palpi small, the latter surpassing the former. Palpi composed of 5 segments; segment II the largest, devoid of setae; segment IV with a long bristle above, longer than the segment itself, and a similar bristle laterally; last segment of palpi about as thick as long, with a subterminal nail-shaped seta as long as the segment, and 2 terminal bristles, each longer than the segment. The mandibular plate nearly twice as long as wide, its greatest width at a point 26 percent of its length from its hind margin, tapering anteriorly to a very narrow, slightly notched tip. The funnel-shaped invagination opens anteriorly over base of rostrum. Legs short, stout, the 2 posterior pairs mostly concealed from view when the mite is seen from above, the last pair failing by much to reach the hind margin of abdomen; outline of segments less crenulate than

usual; no conspicuous constriction between the trochanter and femur of any of the legs. Tarsi truncate near tip, then produced as a short "neck" bearing a pair of stout claws, from the outside of which arises a long, knobbed tenent hair, and from the inside face evidently 2 tenent hairs; between the claws is a pulvillus lined on each side with a pectinated series of shorter tenent hairs; the number and details of these tenent hairs is difficult to observe. Tarsi I dorsally bears 2 tactile hairs longer than the segment, arising from tubercles; a subclavate seta close to the latter, borne on a tubercle, and about 5 additional subterminal hairs, 1 of which arises from a stout tubercle. Ventrally, on caudal portion of abdomen is a chitin-bordered genito-anal field; 2 short, simple setae situated in front of genital shield, 4 longer, pectinate setae in a transverse row immediately in front of caudal border of this shield; 3 short submedian setae lie on each side of the anus, the 2 anteriormost simple, the hind pair pectinate. The postcoxal area of venter is devoid of reticulations, but with obscure, transverse striations on its posterior portion. Venter of rostrum with a pair of long hairs just behind coxae I, and a pair of short setae under segment I of palpi.

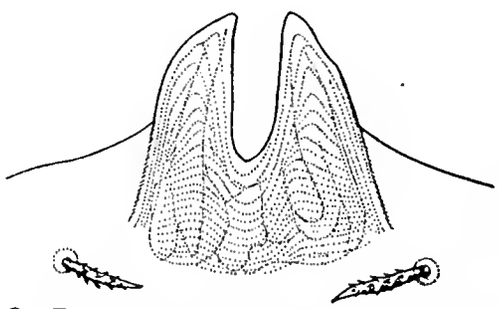
The male was not described by Ewing (1917), and it has not been seen by the present author.

From Ames, Iowa, from branch of cedar, collected by H. E. Ewing; also collected by Ewing from several points in Oregon from arbor vitae. The material from which the above description was drawn is in the collection of the present writer and was taken from arbor vitae, San Jose, Calif., and Beverly Hills, Calif., and from cypress, West Los Angeles, Calif.

Pentamerismus oregonensis, new species
Text Fig. 9; Plate IX

Female: Length, 0.26 mm. An oval, crimson mite, usually bearing centrally a number of dark markings; broadly rounded in front and behind; widest across middle of abdomen. Greatest width of body about two-thirds its length; length of cephalothorax slightly more than one-fourth that of body to front margin of cephalothorax. A much reduced semihyaline plate projecting free from cephalothorax anteriorly, lying entirely between legs I, and consisting only of a median pair of narrow lobes. Dorsal integument of body reticulated, the areolae laterad of mandibular plate averaging one-third longer than wide. One perfect and 1 imperfect eye cornea on each side sublaterally, situated a little be-

hind the humeral angle of cephalothorax. Dorsally the cephalothorax bears 3 pairs of weakly pectinated setae; 1 pair at anterior border over coxae I, 1 in front of eyes, and 1 laterad of imperfect eye. Abdomen bearing 24 setae dorsally; 7 along each lateral margin from main suture back to caudal tip, these somewhat longer than usual for this genus, and distinctly pectinate; a transverse series of 4 inconspicuous setae near the main suture, a transverse series of 4 similar setae opposite the second pair of



Text Fig. 9. *Pentamerismus oregonensis*, new species. Anterior cephalothoracic plate, showing single pair of lobes and frontal setae.

lateral setae, and 2 similar setae over the genital plate. The dorsal abdominal stigmata appear to be lacking. Rostrum and palpi small, subequal. Palpi composed of 5 segments; segment II the largest, with a strong seta dorsally; segment IV with a strong seta above, longer than the segment, and a similar bristle laterally; last segment of palpi a trifle thicker than long, slightly emarginate above and below, with 2 terminal setae longer than the segment, and with a subterminal nail-shaped seta as long as the segment. The mandibular plate about one-half again as long as wide, its greatest width at a point 29 per cent of its length from its hind margin, tapering anteriorly to an unnotched tip. The funnel-shaped invagination opens anteriorly over base of rostrum, surrounding tip of protruded mandibular plate. Legs short, stout, surface of segments moderately rugose, no conspicuous constriction between trochanter and femur of any of the legs; the 2 posterior pairs of legs largely concealed when the mite is viewed from above; the last pair of legs failing by much to reach the hind margin of abdomen. Tarsi strongly truncate near tip, then produced from the ventro-distal angle as a short "neck," bearing a pair of stout claws, each of which bears on its inner and outer face a knobbed tenent hair longer than the claw; between the claws is a pulvillus lined on each side with a pectinated series of shorter tenent hairs; the number and details of the tenent hairs is difficult to observe. Tarsi I dorsally bearing 2 tactile hairs longer

than the segment itself; a subclavate seta arising close to the shorter of these hairs; 2 nail-shaped setae arising from stout, cylindrical tubercles at either side of the "neck"; 1 or 2 additional hairs arising subterminally. Ventrally, on caudal portion of abdomen is a genito-anal field; 2 simple setae are situated in front of genital shield, 4 similar setae in a transverse row just in front of the posterior border of this shield; 3 short, simple submedian setae lie on each side of the anus; the genital shield is sculptured (as shown). The postcoxal area of venter is devoid of reticulations, but with mostly transverse striations. Venter of rostrum bearing a pair of long hairs behind coxae I, and a pair of short hairs under segment I of palpi.

The male is unknown to the author; this is strange, considering the fact that hundreds of this mite have been collected and studied.

Type slide: Catalogue No. 1531, United States National Museum.

The type material is from Rhododendron, Oreg., November 19, 1944, from *Libocedrus decurrens,* collected by Jessie D. McGregor.

Genus Trichadenus Rondani, 1870

Trichadenus Rondani, Bul. Soc. Ital. II, pp. 166-168, 1870.
Dolichotetranychus Sayed, Bul. Mus. Nat. Hist. Paris, 2d ser., vol. 10, p. 606, 1938. New synonymy.
Genotype: *Trichadenus sericariae* Rondani, 1870.

Mites with elongated body, about twice as long as wide, blunt and barely concave in front; cephalothorax roughly rectangular. Abdomen tapering to a narrowly rounded caudal tip. Legs I and II remotely separated from legs III and IV. Rostrum moderately long; palpi very small, simple, of three segments. A funnel-shaped invagination at front of body over the rostrum. Paired eye corneae near middle of lateral margin of cephalothorax. Body hairs appear to be simple. Tip of tarsus bearing a long tactile hair above; a weak claw occurs at the forked junction of a long tenent hair with a shorter pectinate structure, this arrangement duplicated on each tarsus; a pulvillus borne between these duplicates, and is furnished with double pectinate series of short hairs.

In connection with his studies of the genus *Tenuipalpus,* Baker found that *Dolichotetranychus* is a synonym of *Trichadenus.* Accordingly, *Dolichotetranychus* is herewith reduced to synonymy.

Sayed (1938) compared *Trichadenus floridanus* (Banks) from pineapple, Florida, with a mite in Egypt on pineapple, Bermuda grass, and a reed, and concluded that they were identical. Sayed also concluded that this mite had been placed improperly in the family Tetranychidae and in the genus *Stigmaeus,* and created for it the genus *Dolichotetranychus,* at the same time placing it under his new subfamily Pseudotetranychinae. As previously stated, Baker has demonstrated that Oudeman's Pseudoleptidae predates Sayed's Pseudotetranychinae.

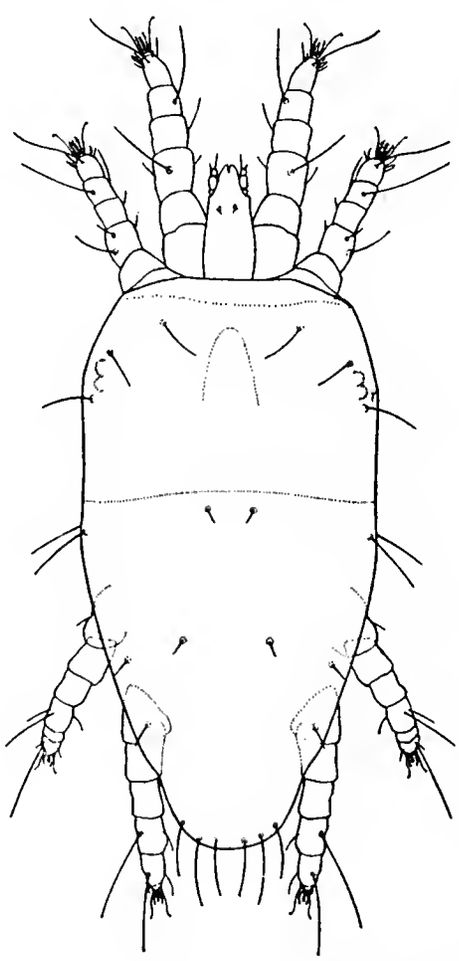
Trichadenus floridanus (Banks), new combination
Text Fig. 10; Plate X

Stigmaeus floridanus Banks, U. S. Dept. Agr. Tech. Ser. No. 8, p. 77, fig. 16, 1900.

Siteroptes carnea Banks, Proc. Ent. Soc. Wash., vol. 7, p. 140, 1906.

Stigmaeodes cinctus Ewing, Psyche, vol. 18, No. 1, pp. 39-40, 1911.

Dolichotetranychus floridanus (Banks) Sayed, Bul. Mus. Nat. Hist. Paris, 2d ser., vol. 10, No. 6, pp. 606-610, figs. 8-12, 1938.



Text Fig. 10. *Trichadenus floridanus* (Banks). Female mite, dorsal view.

The following description is based on the study of many specimens from pineapple, West Palm Beach, Fla., from the same host from Cuba, and of numerous specimens from grasses from several western states.

Female: Body elongated, twice as long as wide, blunt and barely concave in front, sharply rounded at caudal end which bears six setae. Dorsal integument nonreticulated, but evidently with longitudinal striae; weakly chitinized, shriveling in media. Legs I and II remotely separated from legs III and IV. Rostrum relatively long. Palpi very small, simple, of three segments; segment II the largest, bearing dorsally a short hair; terminal segment bearing subterminally a hair longer than the segment, and distally a stout, nail-shaped seta. A funnel-shaped invagination occurs anteriorly, overlying the rostrum. Paired eye corneae near the middle of lateral margin of cephalothorax. Eleven pairs of setae on dorsum of body as follows: A shortish hair behind each coxae II, a similar seta in front of and one behind eyes, a slightly longer hair at each humeral angle of abdomen, a minute submarginal seta close behind coxae III and a similar seta overlying coxae IV; six shortish setae along caudal margin of abdomen; a pair of minute submedian setae close behind main suture, and a similar pair between coxae III. Near each abdominal, humeral hair, a similar hair arises from the venter, and may be mistaken for a dorsal seta. A pair of minute, clavate setae submedially on top of rostrum behind palpi. A pair of long hairs on venter of rostrum even with coxae II. Mandibular plate slightly more than twice as long as wide; widest at a point about one-fourth its length from its hind margin, tapering forward to a sharply rounded tip. Tip of tarsus with the following duplicated structures: A long tenent hair fused sub-basally with a shorter abortive tenent hair which bears a pectinate series of minute, knobbed hairs; at point of fusion arises a weak, easily overlooked claw; distally, between these duplicated structures, is borne a pulvillus lined on each side with a pectinate series of minute knobbed hairs; tarsi I and II bear dorsally a long, tactile hair, and subterminally a spindle-shaped seta, and at least five additional setae. All body setae and nearly all leg setae appear to be simple.

Male: Considerably smaller than female, with abdomen somewhat constricted. Palpi similar to those of female, without a horn-shaped spur (present on males of some species). Penis one-

half as long as body, filamentous, exserted through a sheath or aedeagus.

Banks (1900) states that this mite lives in colonies at the bases of the imbricated leaves of the pineapple, and is of economic importance due to the fact that its punctures give access to destructive fungi. Reported from pineapple, salt grass and Bermuda grass in the United States. Sayed (1938) recorded it from pineapple, Bermuda grass and the reed, *Phragmites communis*, in Egypt.

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EXPLANATION OF PLATES

Plate I

1-10. *Brevipalpus californicus* (Banks). 1, anterior cephalothoracic plate; 2, areolae on dorsal integument laterad of mandibular plate; 3, mandibular plate; 4, tarsus of right leg I from outside showing terminal appendages; 5, humeral angle of cephalothorax showing eye corneae and nearby setae; 6, dorsal abdominal pore; 7, tip of tarsus of right leg I from above; 8, tip of rostrum and stylet, lateral view; 9, right palpus from outside; 10, caudal margin of abdomen from above, showing marginal setae.

Plate II

1-10. *Brevipalpus inornatus* (Banks). 1, anterior cephalothoracic plate; 2, left humeral angle of cephalothorax showing eye corneae and nearby setae; 3, mandibular plate; 4, region of venter behind left coxa II showing number and distribution of areolae; 5, areolae on dorsal integument laterad of mandibular plate; 6, dorsal abdominal pore; 7, right palpus from outside; 8, one of the lateral abdominal setae; 9, caudal portion of venter of female showing genital plate and anus; 10, tip of tarsus of left leg I from outside showing terminal appendages.

Plate III

1-9. *Brevipalpus cardinalis* (Banks). 1, anterior cephalothoracic plate, two frontal setae, and right eye corneae, dorsal view; 2, areolae on dorsal integument laterad of mandibular plate; 3, dorsal abdominal pore; 4, mandibular plate; 5, tip of tarsus of leg I from outside showing terminal appendages; 6, dorsal view of female mite (legs not shown); 7, left palpus viewed from outside; 8, one of the lateral abdominal setae; 9, caudal portion of venter of female showing genital plate and anus.

Plate IV

1-12. *Brevipalpus lewisi,* new species. 1, left palpus from outside; 2, collar trachea; 3, anterior cephalothoracic plate; 4, left portion of cephalothorax showing areolae of dorsal integument, eye corneae, and nearby setae; 5, mandibular plate and funnel-shaped invagination, from above; 6, right humeral angle of cephalothorax showing eye corneae and nearby setae, from above; 7, tip of tarsus, distal view, semi-diagrammatic; 8, tip of rostrum and stylet, lateral view; 9, left abdominal pore showing its location with reference to the main suture; 10, caudal portion of venter of female showing genital plate and anus; 11, right tarsus I from outside, showing terminal appendages; 12, one of the lateral abdominal setae.

Plate V

1-11. *Brevipalpus woglumi,* new species. 1, anterior cephalothoracic plate and frontal setae; 2, tarsus II, ventro-distal view, showing terminal appendages; 3, left tarsus I from outside, showing terminal appendages; 4, mandibular plate; 5, dorsal abdominal pore; 6,

region of venter behind left coxa II showing number and distribution of areolae; 7, left portion of cephalothorax showing areolae on dorsal integument, eye corneae, and nearby setae; 8, left palpus from outside; 9, one of the marginal abdominal setae of second nymphal stage; 10, caudal portion of abdomen showing eight marginal setae, from above; 11, tip of rostrum and stylet, lateral view.

Plate VI

1-8. *Brevipalpus salviae,* new species. 1, anterior cephalothoracic plate and basal portion of frontal setae of female, from above; 2, areolae on dorsal integument laterad of mandibular plate; 3, rostrum, palpi, and anterior cephalothoracic plate of male, from above; 4, tip of left tarsus I showing terminal appendages, from outside; 5, collar trachea; 6, dorsal body seta; 7, dorsal view of female mite (legs not shown); 8, right palpus of female, from outside.

Plate VII

1-8. *Pentamerismus canadensis,* new species. 1, anterior cephalothoracic plate and frontal setae, from above; 2, areolae of dorsal integument laterad of mandibular plate; 3, female mite, dorsal view; 4, left palpus of female from above; 5, dorsal seta near eye cornea; 6, dorsal marginal seta at humeral angle of abdomen; 7, last marginal abdominal seta, from above; 8, frontal seta anteriorad of mandibular plate.

Plate VIII

1-8. *Pentamerismus erythreus* (Ewing). 1, areolae on dorsal integument laterad of mandibular plate; 2, terminal appendages of tarsus I, ventro-distal view; 3, right tarsus I showing terminal appendages, from outside; 4, female mite, dorsal view; 5, marginal abdominal seta; 6, left palpus of female, from outside; 7, tip of rostrum and stylet, lateral view; 8, anterior cephalothoracic plate and frontal setae, from above.

Plate IX

1-7. *Pentamerismus oregonensis,* new species. 1, areolae on dorsal integument laterad of mandibular plate; 2, female mite, dorsal view (legs not shown); 3, portion of venter behind left coxa II showing striations; 4, right palpus of female, from outside; 5, right tarsus I showing terminal appendages, from outside; 6, right tarsus I showing terminal appendages, from above; 7, caudal portion of venter of female showing genital plate, anus, and four marginal setae.

Plate X

1-8. *Trichadenus floridanus* (Banks). 1, tarsus I of female showing terminal appendages, viewed from outside; 2, tarsus I of female showing terminal appendages, from above; 3, right palpus of female, viewed from outside; 4, penis and aedeagus of male, lateral view; 5, aedeagus of male, lateral view; 6, anterior funnel-shaped invagination and mandibular plate, viewed from above; 7, rostrum and palpi of female, from above; 8, right eye corneae and nearby setae, from above.

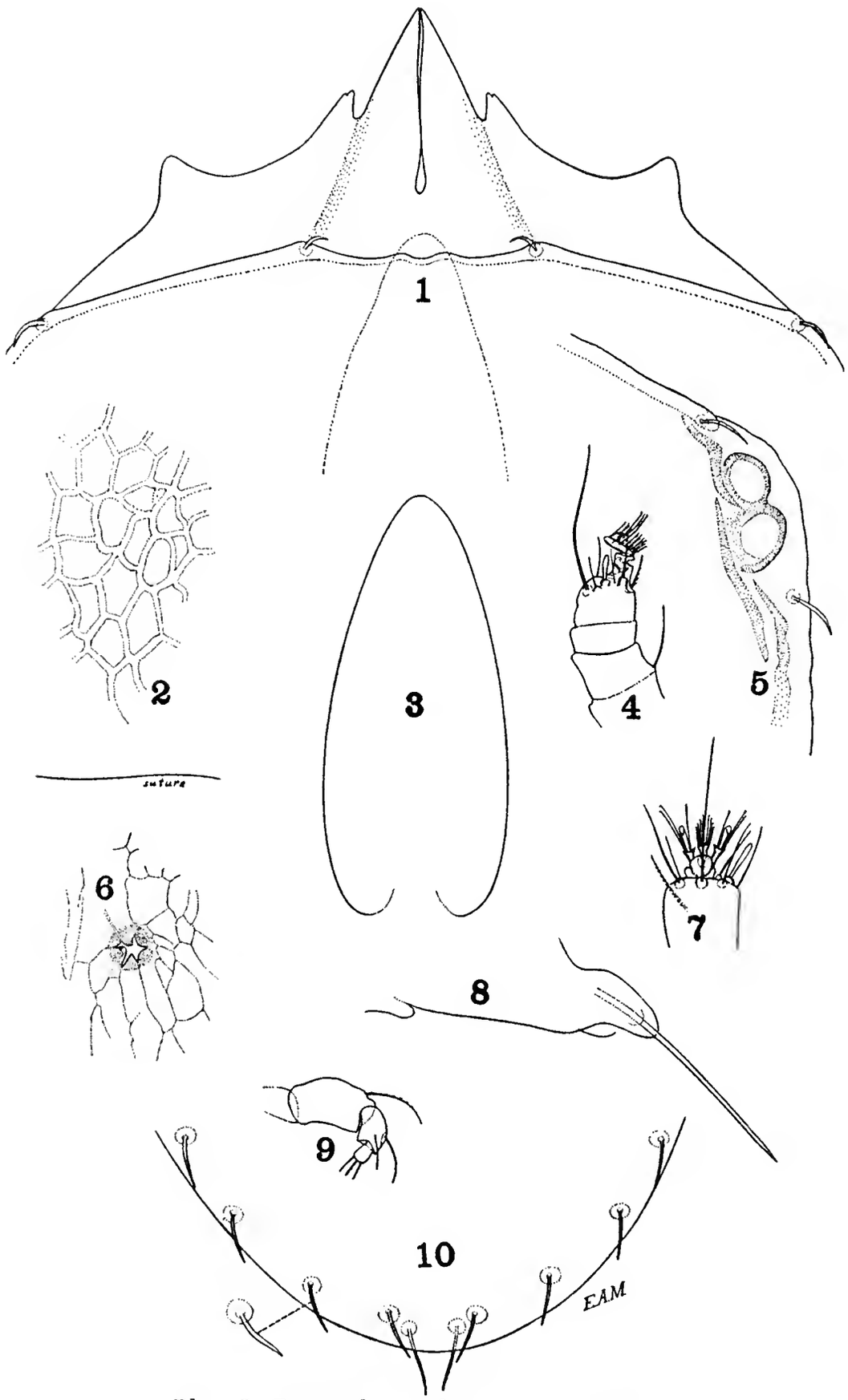

Plate I. *Brevipalpus californicus* (Banks).

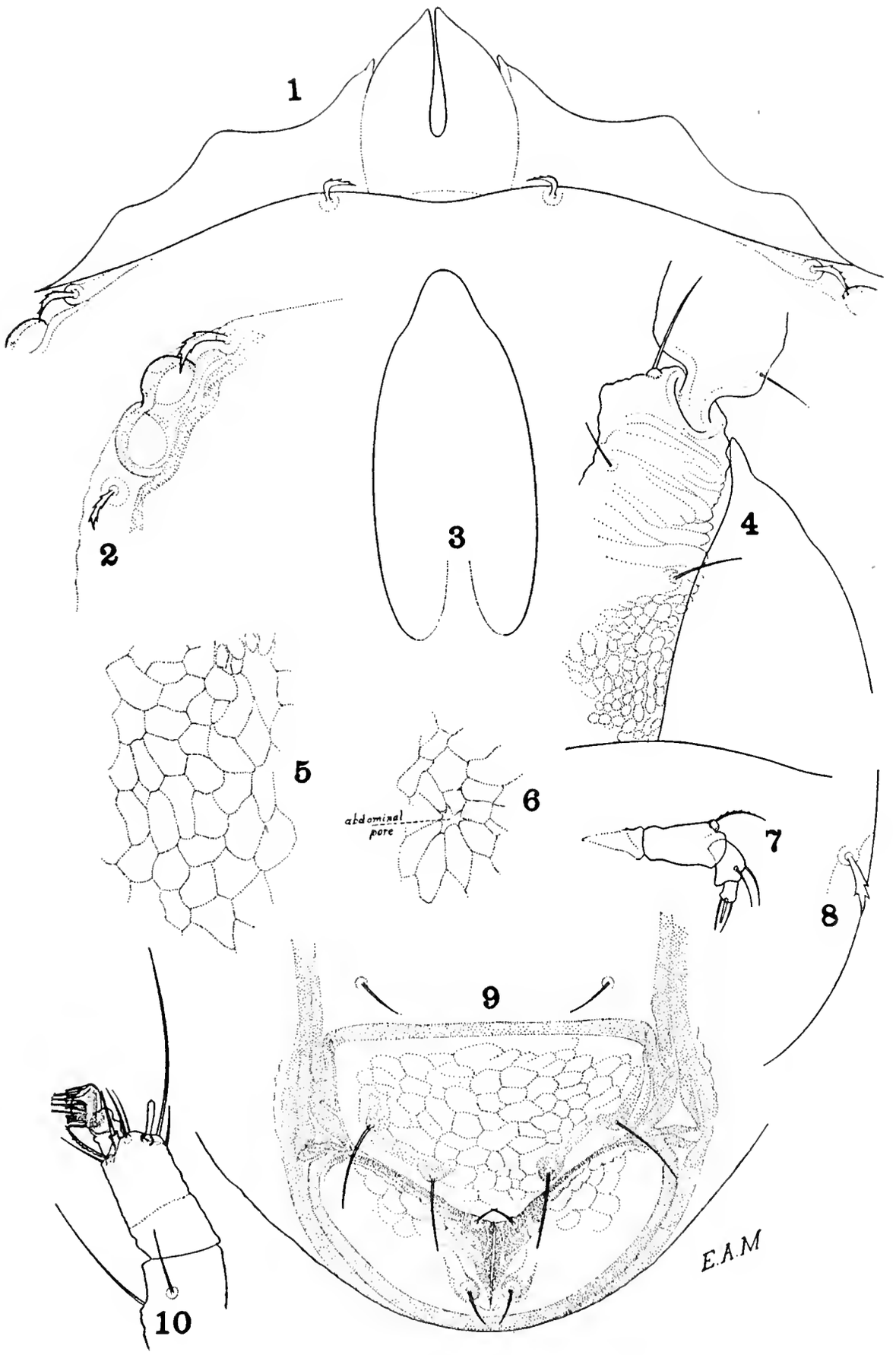

Plate II. *Brevipalpus inornatus* (Banks).

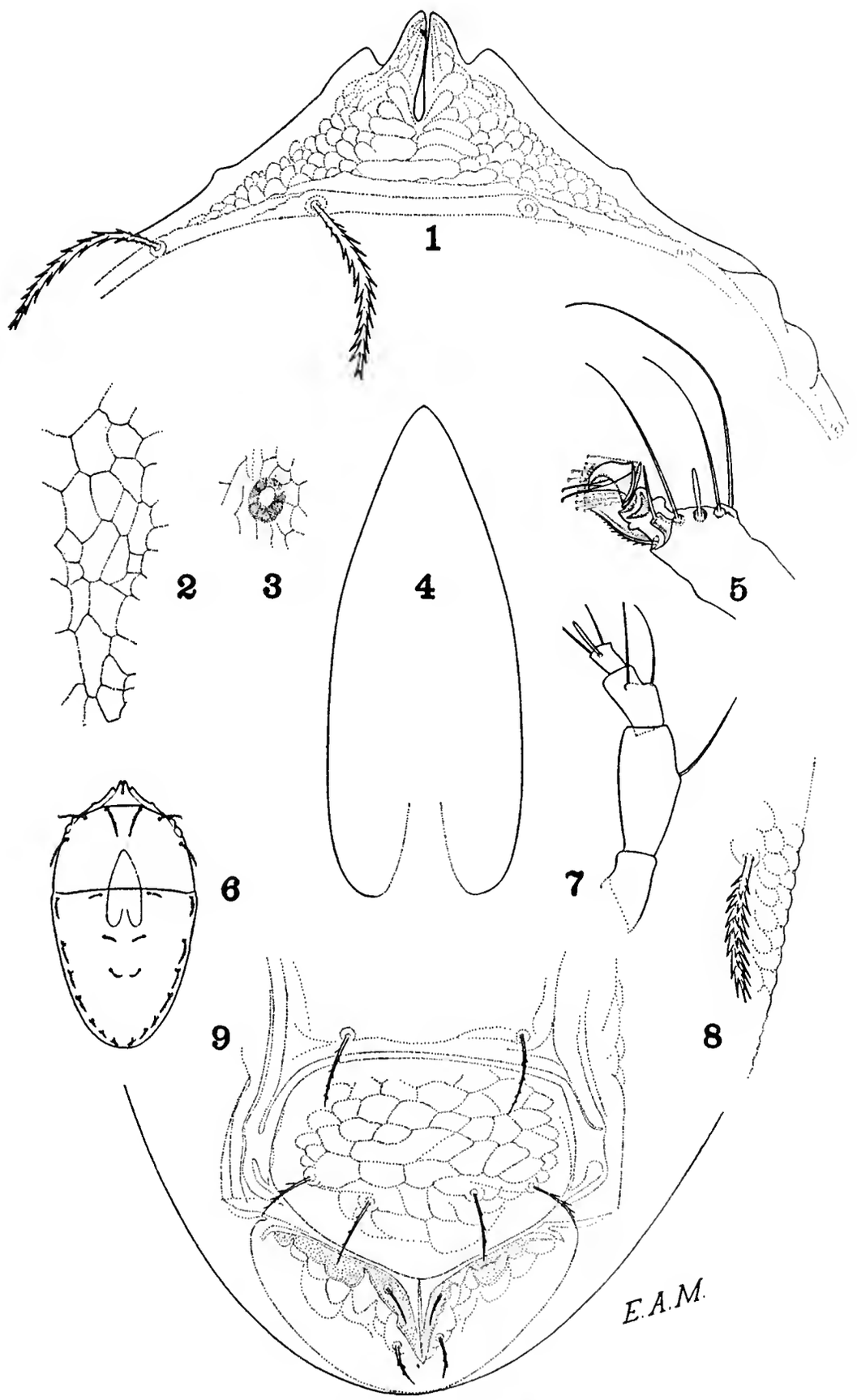

Plate III. *Brevipalpus cardinalis* (Banks).

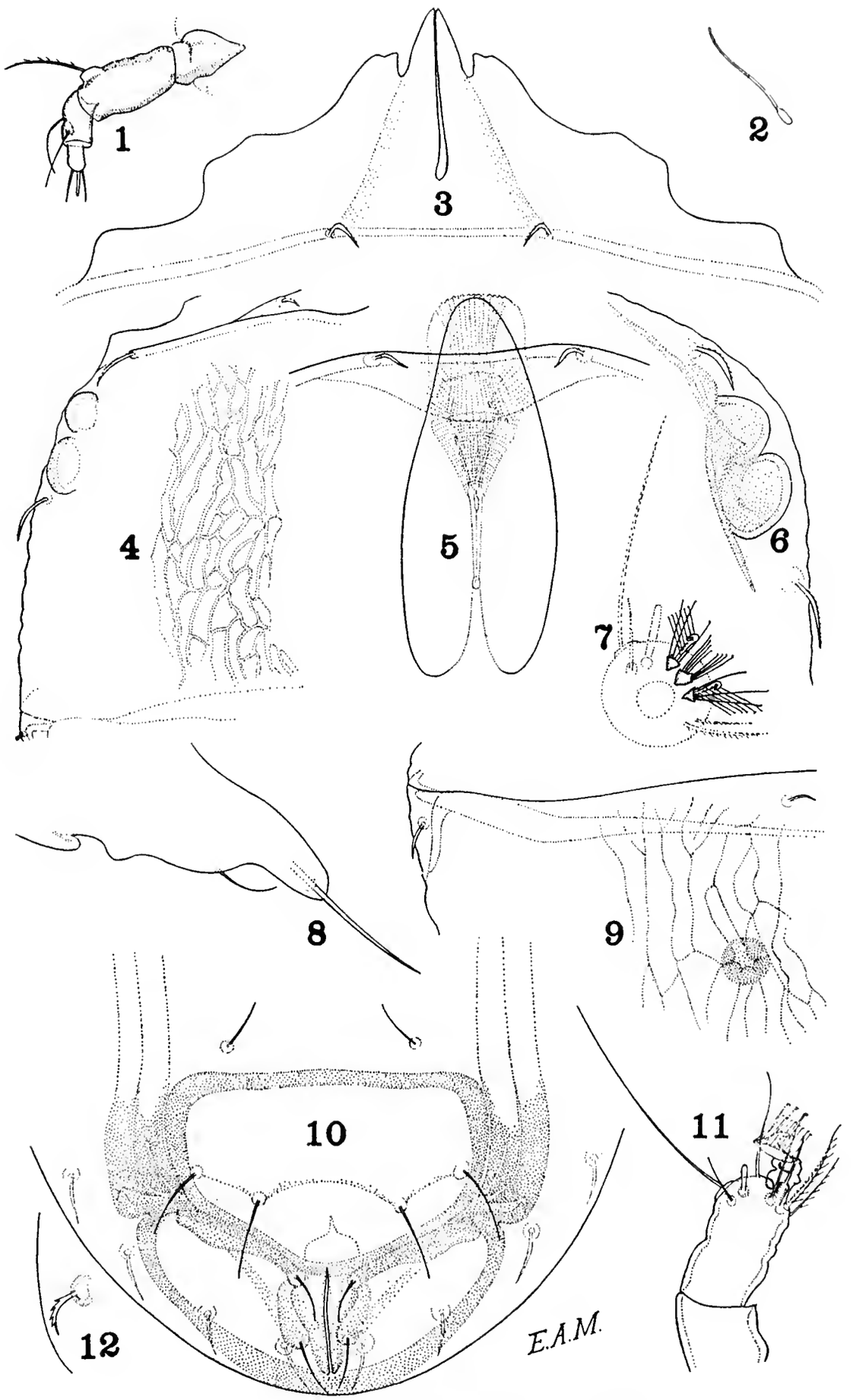

Plate IV. *Brevipalpus lewisi*, new species.

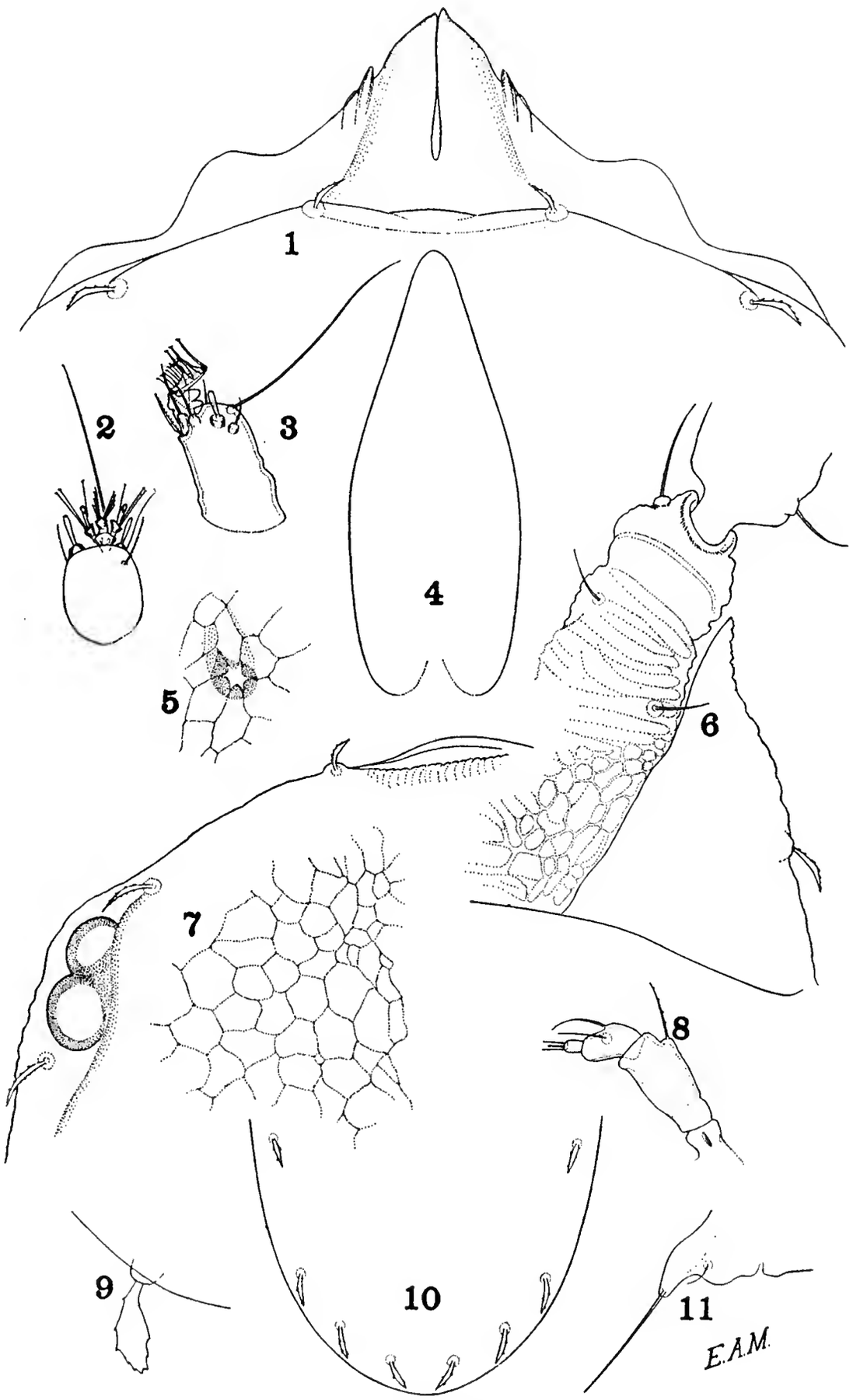

Plate V. *Brevipalpus woglumi*, new species.

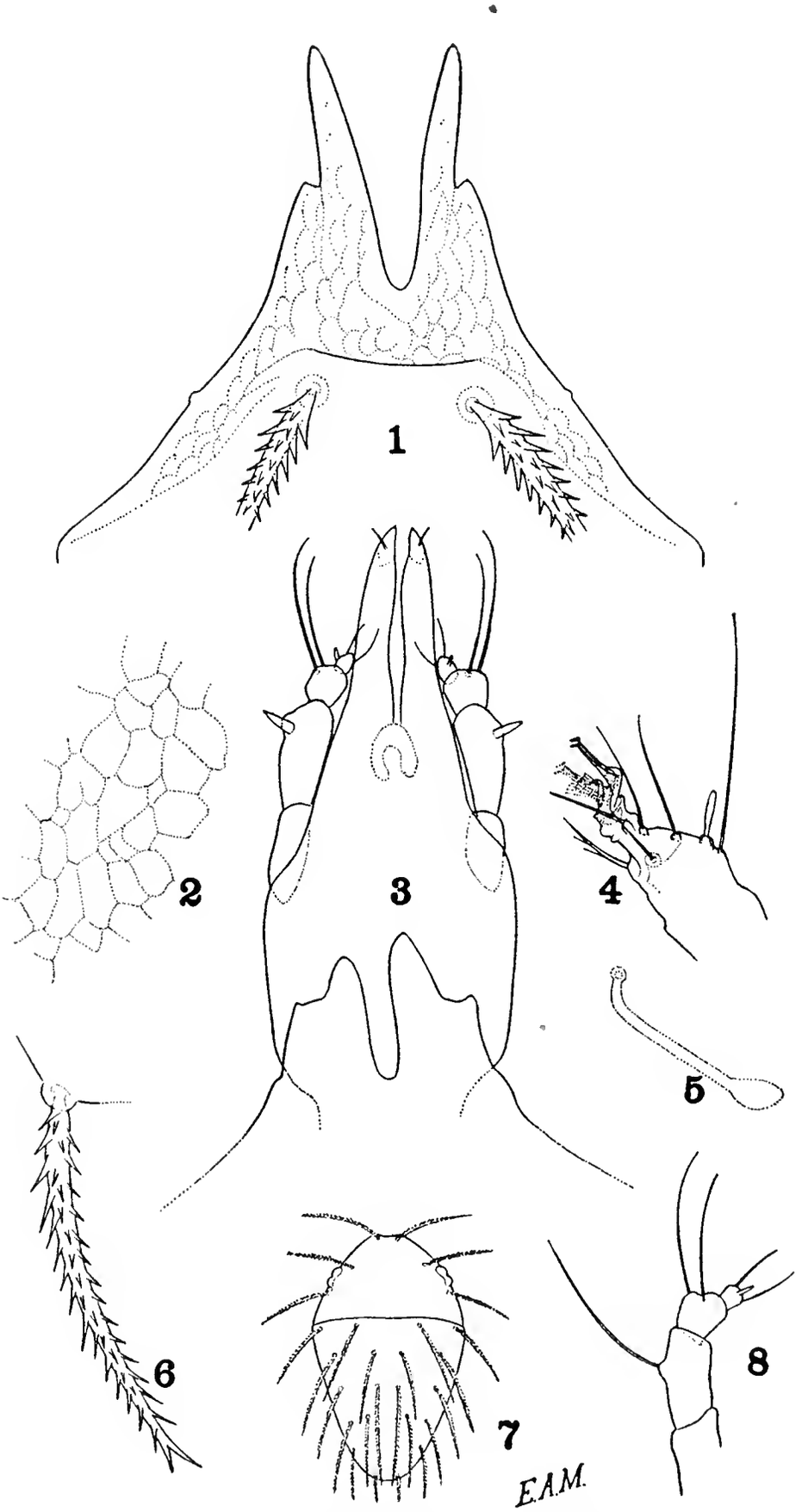

Plate VI. *Brevipalpus salviae*, new species.

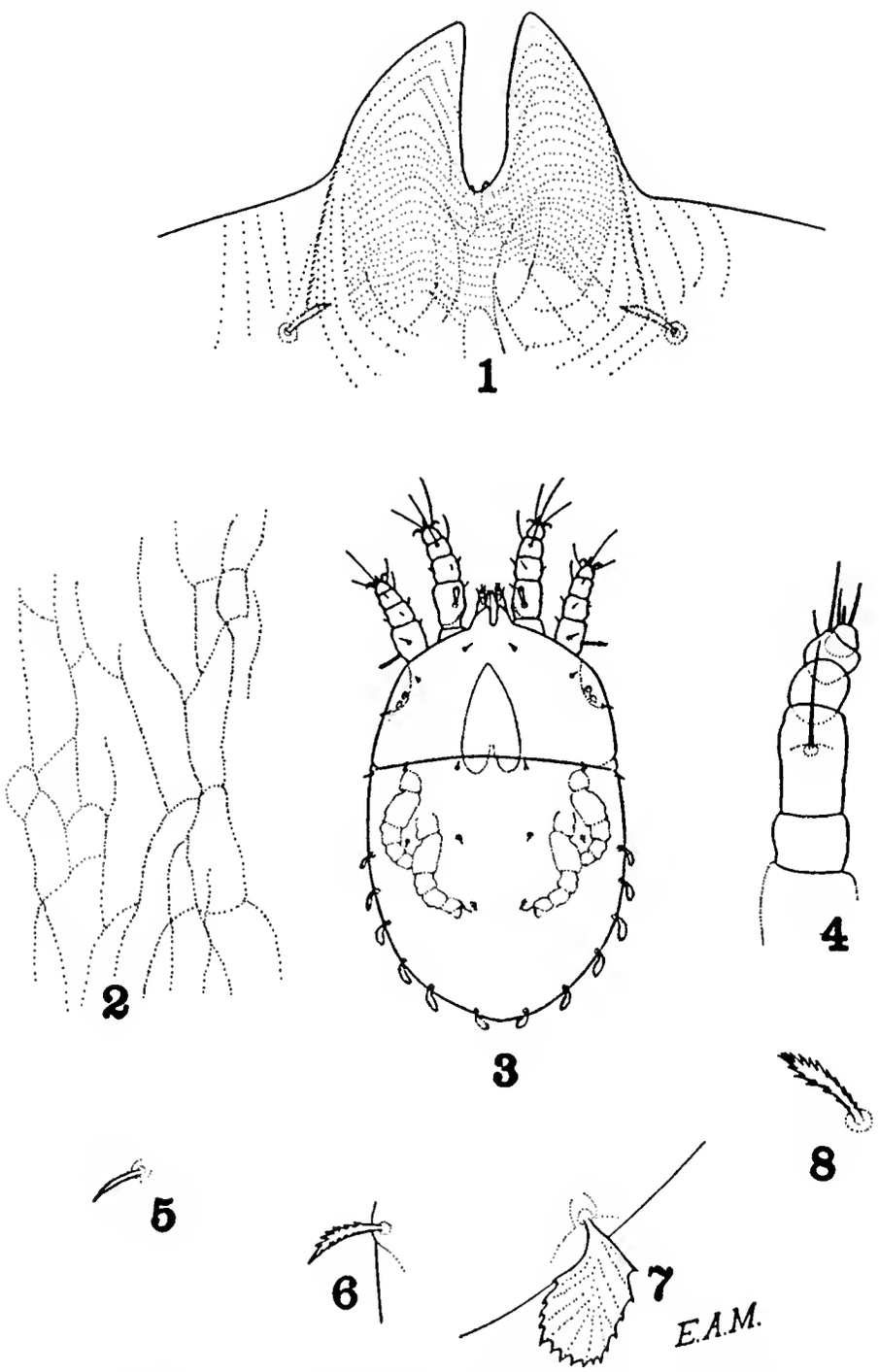

Plate VII. *Pentamerismus canadensis*, new species.

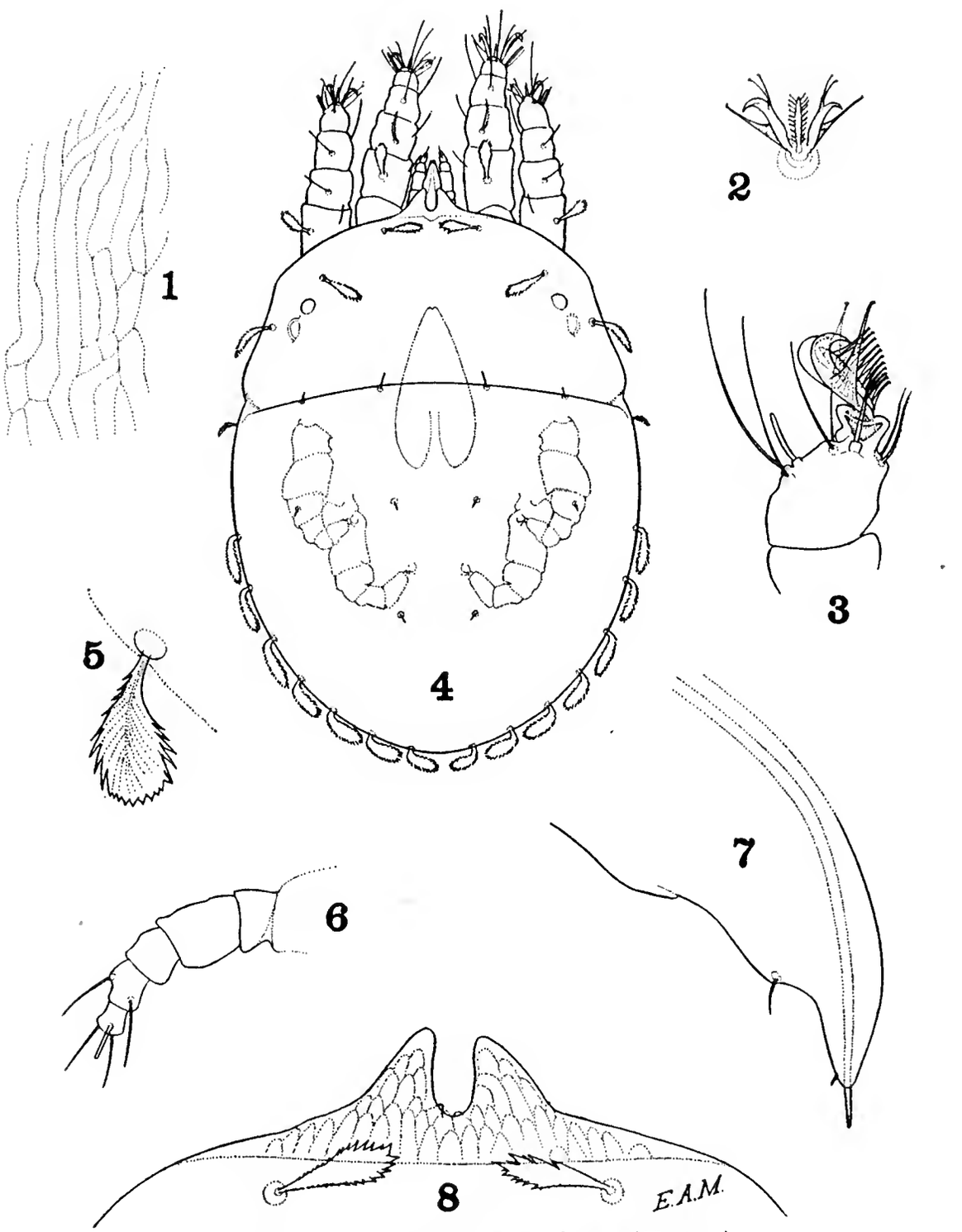

Plate VIII. *Pentamerismus erythreus* (Ewing).

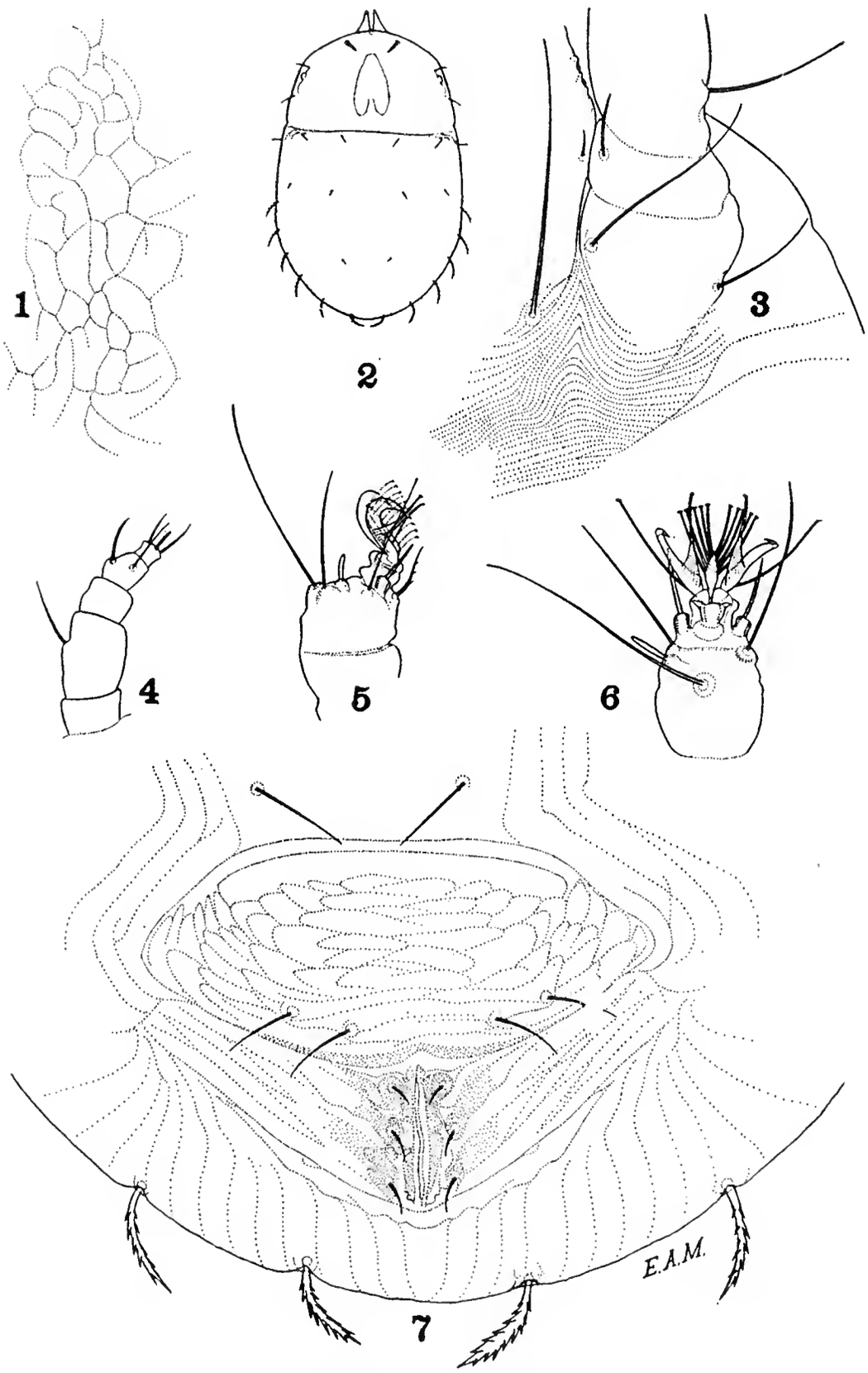

Plate IX. *Pentamerismus oregonensis*, new species.

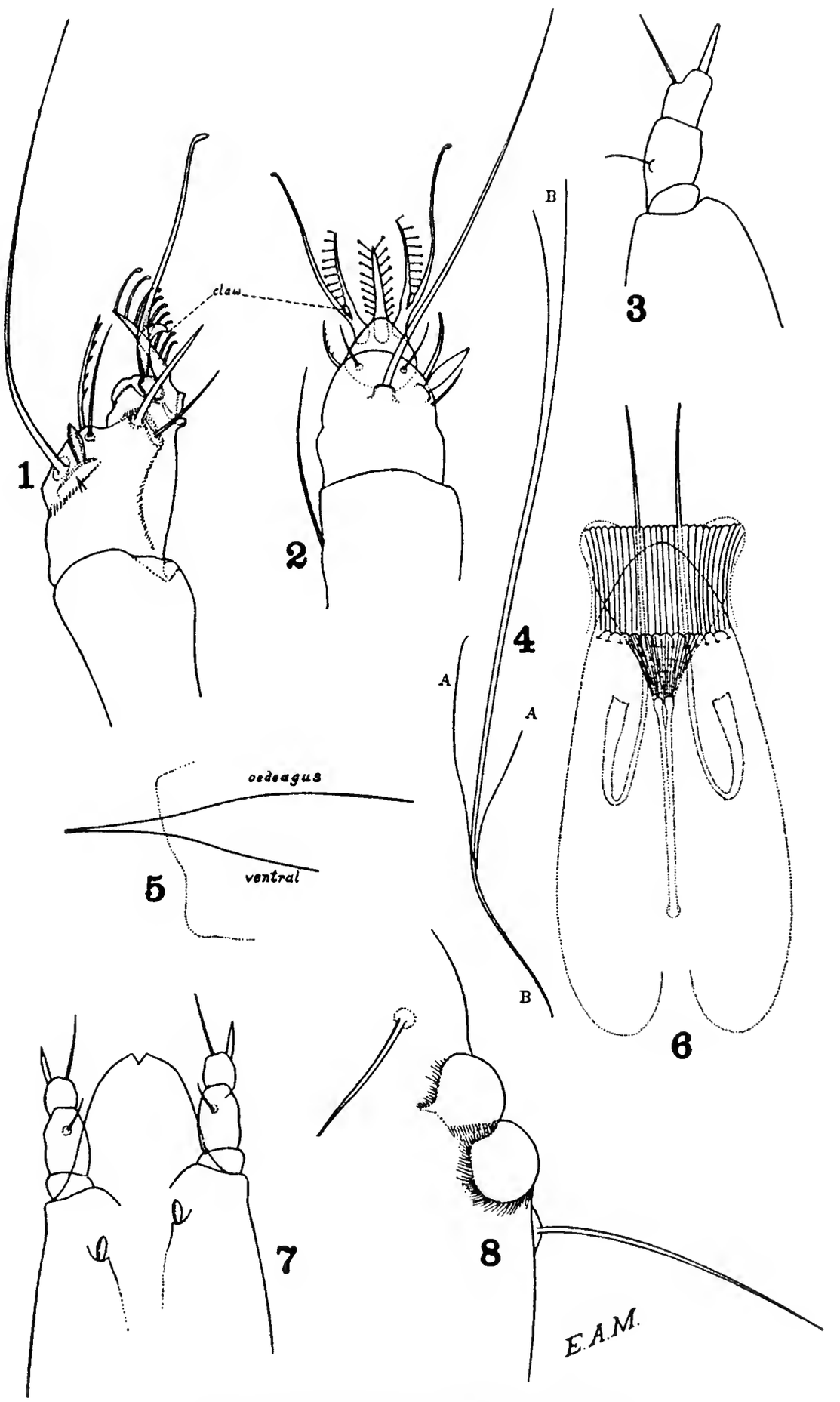

Plate X. *Trichadenus floridanus* (Banks).